



November 2000

## **TO: RECIPIENTS OF THE 1999-2000 UTAH CENTERS OF EXCELLENCE PROGRAM ANNUAL REPORT**

Attached is the Annual Report for the Utah Centers of Excellence Program. The report summarizes the achievements of the program during the fiscal year from July 1, 1999 through June 30, 2000, and, in addition, details the funding allocations for the current 2000-2001 fiscal year.

Since the founding of the Centers of Excellence Program in 1986, the Annual Report has summarized the financial and business accomplishments in terms of dollars granted, matching funds received, jobs created in both Centers and businesses, and other statistical data. This information provides appropriate measures of the status of the program on an annual basis. In addition to the statistical summaries, the report includes descriptions of Utah companies that base all or part of their revenue stream on technologies developed at funded Centers of Excellence and have licensed those technologies from Utah universities. Our intent is to review the Centers of Excellence Program from the standpoint of its influence upon a group of Utah's newest high tech companies. We hope to demonstrate that the funding of the program represents an extremely valuable investment in Utah's current economic base and in the ongoing development of its high technology industries.

The Centers of Excellence Program continues to be one of the nation's most successful technology commercialization programs as measured by matching dollars, significant new commercialized products, and state economic impact. We believe that with a continued and strengthened emphasis on the importance of commercialization and with the ongoing support of the new enhancements described, the Centers of Excellence Program will have an ever expanding and important role to play in Utah's economic future.

Respectfully submitted,

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**UTAH**  
**Centers of Excellence**  
**Program**

**ANNUAL REPORT**

**July 1, 1999 - June 30, 2000**

**Published November 2000**

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# **I. EXECUTIVE SUMMARY**



# EXECUTIVE SUMMARY

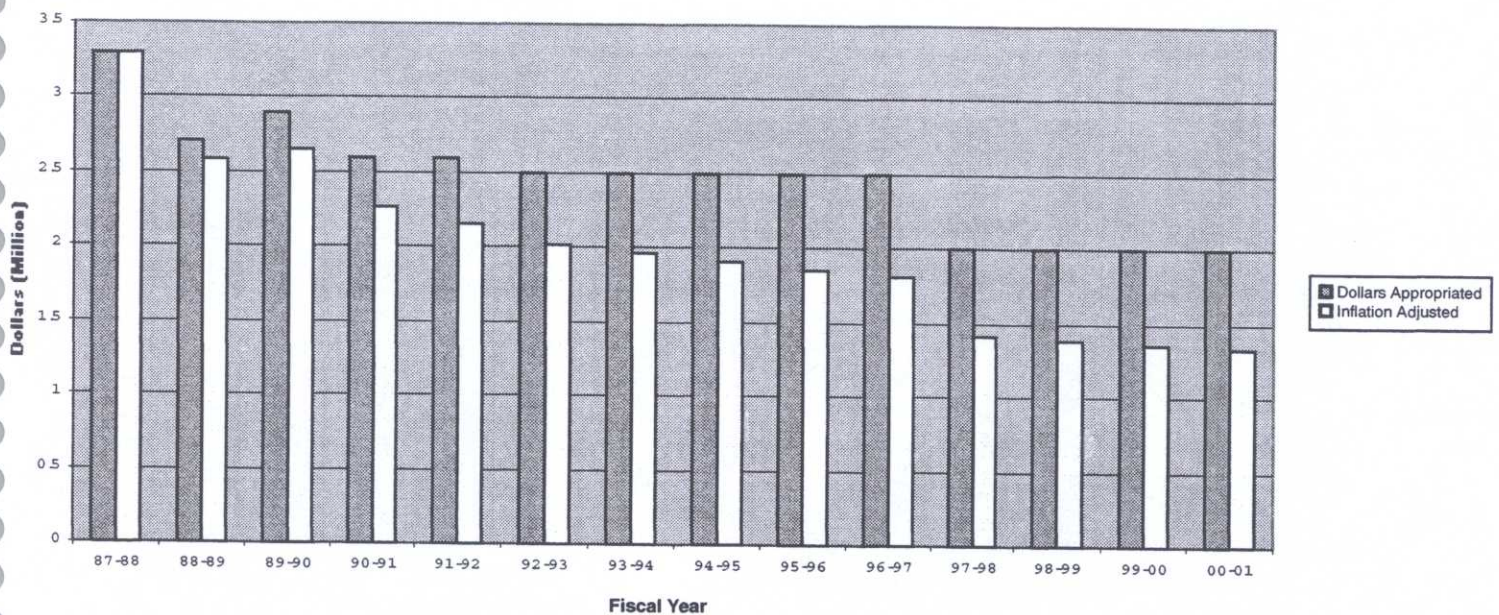
The Utah State Legislature established the Centers of Excellence Program (COEP) in 1986. They recognized that the growth of new industry and expansion of existing industry is highly dependent on a strong technology base, new ideas, concepts, innovations, and prototypes. Furthermore, the Legislature approved the annual allocation of economic development funds to the COEP, to be awarded to college and university faculty on a competitive basis.

The goals of the COEP are to enhance and expand selected applied research and development activities at Utah's institutions of higher education. They are focused on the development of technologies, which have potential for economic development in the state; and to assist in the actual commercialization of those technologies, in concert with the technology licensing offices at the respective institution. The proprietary value of technologies created is reflected in the number of patents/copyrights issued, which produce royalty-bearing licenses that are signed by businesses. The economic impact is the sum effect of the creation of new companies, the enhancement of business opportunities for existing companies that license COEP technologies, and in the growth of Utah's job opportunities.

During the 1999-2000 fiscal year the Centers Program issued \$2.070 million in grants to 16 active Centers (Appendix 1), for use in bringing significant new technologies closer to the marketplace. In the competitive selection process, 12 centers received continued funding and 4 new centers were selected for funding. The Center distribution with respective funding was as follows: nine at University of Utah (\$1,295,000), three at Utah State University (\$320,000), and four at Brigham Young University (\$455,000). In addition, the program also funded the commercialization consulting effort, at a level of \$6,000 per funded Center, for a total of \$96,000. Hence, the total sum of funds disbursed during fiscal year 1999-2000 was \$2,166,000; the legislative appropriation was \$2 million and the remaining was carryover from the previous year.

The 16 Centers received matching funds of \$12.37 million, resulting in a matching fund ratio of 6:1. The cumulative state funding for the COEP between 1986 and 2000 was \$32.3 million and the cumulative matching funds received was \$345.1 million, resulting in a matching fund ratio of 10.7:1. This is believed to be the highest in the nation for programs of this kind and represents a critically important leverage for success in the program.

Centers of Excellence Funding History





The major accomplishments of the 1999-2000 funded Centers include starting 11 new companies out of which 2 were created during the reporting fiscal year (Section 2, Center Related Business Activity). With respect to creating proprietary value, these Centers have received a total of 20 patents/copyrights and have filed for an additional 62 patents. So far businesses have signed 24 license agreements to utilize the intellectual property created by these Centers.

Over the full life of the program, intellectual property created by faculty participating in the Centers of Excellence accounts for 107 patents resulting in 184 license agreements. Since the inception of the program, 134 companies have been created and have licensed proprietary technology from the program, creating thousands of jobs, in the high technology sector of the economy. Surveys conducted by the industry associations (Utah Information Technology Association & Utah Life Sciences Association) report average salaries in excess of \$45,000 for Utah's key high technology segments.

The Centers of Excellence Program continues to be one of the nation's most successful technology commercialization programs as measured by matching dollars, significant new commercialized products, and state economic impact. With strong emphasis on the importance of commercialization the program will have an ever expanding and important role to play in Utah's economic future.

## **II. PROGRAM DESCRIPTION**





OK

# PROGRAM DESCRIPTION

## BACKGROUND OF PROGRAM

The Utah State Legislature created the Centers of Excellence Program (COEP) in 1986 recognizing that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes. The Legislature recommended the allocation of economic development funds each year to the COEP, to be awarded to college and university faculty on a competitive basis. The objectives of the COEP are to enhance and expand the applied technical research activities at institutions of higher education in Utah, to develop technologies that are considered to have potential for economic development in the state, and to assist in the actual commercialization of those technologies. This research and technology commercialization process ultimately results in the creation of new companies, the enhancement of business opportunities for existing companies that license COEP technologies, and in the growth of Utah's job opportunities. In addition, the proprietary value of technologies created is reflected in the number of patents issued and the associated royalty-bearing licenses that are signed.

These measurement parameters (jobs created, companies assisted and/or created, inventions disclosed or patents issued, and license agreements signed) are summarized in the report to the legislature as indicators of the value of the COEP to state economic development. This report will also highlight some of the specific businesses which have either been spun off from funded Centers or been materially influenced by Centers of Excellence funding.

Ongoing funding of the Program has been based upon the real and potential economic impact that the Centers of Excellence Program has had upon the State of Utah during the years since its creation. This Annual Report summarizes the significant accomplishments of the program during the recently completed fiscal year and identifies the long-term economic value of that work.

## PROGRAM OPERATIONS AND OBJECTIVES

The operating methods of the Centers Program have evolved over the years since its inception with a continuing goal of achieving the maximum economic benefit from the individual Centers that have been created. Upon selection on a competitive basis, new Centers are funded with a requirement for a minimum 2:1 matching fund ratio from the private and federal sectors. Matching funds are reported and audited on a regular basis. Centers are also audited regularly for the achievement of technical and commercial milestones. Center directors are required to submit annual reports to the COEP director. The Centers of Excellence Program Annual Report, is based on submitted reports and upon information gathered in site visits, audits and other data sources. In addition, each funded Center is assisted by one or more designated commercialization consultants who assist Center directors in defining commercialization strategies, performing market and competitive analysis, locating potential investors and or licensees, etc.

Centers are normally funded for a maximum of five years and are then expected to be self-sustaining through license contract royalties and new research grants. Centers with especially noteworthy histories and ongoing technological impact are designated as Distinguished Centers and thereafter may be funded on a project-by-project basis as requests are approved.



## **CENTER SELECTION PROCESS**

Proposals from researchers for new and renewal of existing Centers of Excellence are submitted to the COEP office in response to a Request for Proposal which is normally sent in late December. The incoming proposals are critically reviewed by the Centers of Excellence Advisory Council. Centers are selected for funding based on a ranking established in extended review sessions with the Centers Advisory Council.

Since its inception and through FY 1999-2000, the program has created 79 Centers of Excellence, seven of which have been designated as Distinguished Centers, 48 have graduated, and 16 are active during this reporting period.

The State Advisory Council for Science and Technology has advisory responsibility for the Centers of Excellence Program by statute. Members of the Science Council participate on the Centers Advisory Council in reviewing proposals and conducting site visits. This provides Science Council members with in-depth knowledge of the program, Center specific information and a strong technical and industrial perspective for making funding decisions. The State Science Advisor reviews the Annual Report and presents it to the Science Council for acceptance. The Director of the Office of Technology Development serves as an ex-officio member of the State Advisory Council for Science and Technology.

## **COMMERCIALIZATION PROCESS**

Over the past five years, the Centers of Excellence Program has funded a consulting program to assist Center directors in preparing and implementing commercialization strategies. Each Center is unique in terms of which strategy is optimal - there is no single solution and each requires customized approaches.

Early market surveys and competitive analyses are conducted to discover which market segments are most promising and which product features will be of interest to potential customers and licensees. Consultants assist in targeting potential licensees for the technology and in positioning products for anticipated markets.

These early strategic discussions often reveal product variations that can be introduced to the marketplace earlier than previously planned. Such early commercialization has several benefits: (1) getting products to consumers for preliminary market validation and directional planning; (2) early cash flow strengthens continuing research at the Center and hastens financial independence; and (3) the future value of technology licenses are enhanced.

The Centers of Excellence Program office works closely with the technology transfer offices at the respective universities in an effort to extract maximum value from the licenses that are signed for Centers technologies. Through the commercialization consulting program, assistance is given in defining market opportunities, identifying potential target licensees, providing key information for license valuations, and consulting assistance to those companies considering license opportunities.



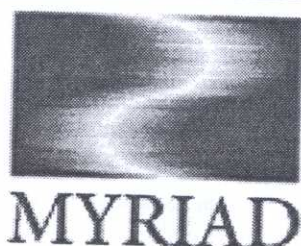


### **III. CENTER RELATED BUSINESS ACTIVITY**

The section highlights a selection of more mature Utah businesses that were established on licensed technologies from Centers of Excellence. These companies have achieved significant milestones during the past year that favorably impact Utah's economic base and represent the ultimate purpose and goal of the Centers program.



**This is a Spin-off Company  
from the Center for Cancer Genetics Epidemiology  
University of Utah**



**MYRIAD GENETICS DISCOVERS NOVEL  
PROSTATE CANCER GENE**

Discovery Triggers \$1 Million Payment  
Salt Lake City  
June 6, 2000

Myriad Genetics, Inc. (Nasdaq: MYGN) today announced it has discovered a novel prostate cancer susceptibility gene, which resulted in a \$1 million payment to Myriad from Schering-Plough Corporation under terms of the Companies' 1997 research collaboration agreement.

To identify this gene, researchers at Myriad employed a proprietary form of linkage analysis that involves tracking a disease susceptibility gene to its location on a specific chromosome. Based on its analysis of prostate cancer families, Myriad determined that inherited mutations in this gene may significantly increase the risk of prostate cancer. The mutation profile of the new prostate cancer gene indicates the potential to form the basis of a prostate cancer susceptibility test.

The discovery of this gene will allow Myriad scientists to more thoroughly investigate the full spectrum of genetic mutations associated with prostate cancer and the role they play in the development of the disease. Furthermore, the gene has been included in a ProNet® pathway discovery program to identify additional genes within the pathway that may provide drug development opportunities.

"The combination of elegant science and the Company's vast genomic resources have again produced outstanding results," said Peter Meldrum, President and Chief Executive Officer of Myriad

Genetics, Inc. "The delivery of this gene to Schering-Plough provides great potential for the development of both diagnostic and therapeutic products for a devastating disease, which kills 40,000 men a year."

Prostate cancer accounts for more than 35% of all cancer incidents in men. In excess of 200,000 new cases are diagnosed each year in the United States alone, of which 5 -10% are thought to be genetically determined.

The alliance between Myriad and Schering-Plough was established specifically to uncover the genetic basis of prostate cancer. According to the agreement, Myriad retains all diagnostic product rights to this gene and will receive a royalty on all sales of relevant therapeutic products developed by Schering-Plough. United States and foreign patents have been filed for this newly discovered gene.

Historically, Myriad has achieved unparalleled success in the identification and characterization of major disease causing genes. These discoveries include genes for hereditary breast cancer, ovarian cancer, brain cancer, melanoma, diabetes, heart disease, and now prostate cancer. The Company has made substantial advances in the process of gene cloning and has been awarded several U.S. patents for technologies that enhance and accelerate gene discovery.

The discovery of the prostate cancer gene culminates a research project between Myriad and its prostate cancer family database and linkage collaborators, which include research groups led by Drs. Lisa Cannon-Albright at the University of Utah, Johanna Rommens at the University of Toronto and Jacques Simard and Fernand Labrie at Laval University Hospital and Endorecherche.

Myriad Genetics, Inc. is an emerging biopharmaceutical company focused on the development of therapeutic and diagnostic products that are based on the use of genomic and proteomic technologies. The Company has established two wholly owned subsidiaries -- Myriad



Pharmaceuticals, Inc., which develops and intends to market therapeutic compounds, and Myriad Genetic Laboratories, Inc., which develops and markets proprietary molecular diagnostic services and has introduced products in the fields of predictive medicine and personalized medicine. The Company has established strategic alliances with Bayer, Eli Lilly, Hitachi, Monsanto, Novartis, Roche, Schering AG and Schering-Plough.

### **MYRIAD GENETICS LAUNCHES MOLECULAR DIAGNOSTIC TESTING IN CANADA**

MDS Laboratory Services to Provide  
BRACAnalysis® Throughout Canada  
Salt Lake City, UT  
March 9, 2000

Myriad Genetics, Inc. (Nasdaq: MYGN) announced today that it has exclusively licensed MDS Laboratory Services, of Toronto, to make available the BRACAnalysis® molecular diagnostic test to women across Canada who may be at risk of breast and ovarian cancer.

The agreement represents the latest development in the execution of Myriad's strategy to expand its molecular diagnostics business into multiple foreign markets during 2000. The current introduction of molecular diagnostic testing in Canada follows the recent launch of Myriad's testing services in Japan, The United Kingdom and Ireland. The Company plans to further increase the domestic market penetration of its existing molecular diagnostic tests in addition to continued development of foreign markets. Myriad also plans to create and introduce additional tests that capitalize on the emergence of predictive and personalized medicine approaches to health care.

MDS Laboratory Services, a division of MDS, Inc., is the largest provider of medical diagnostic testing services in Canada with an established nationwide collection and logistics network. MDS Inc. (TSE:MDS; [www.mdsintl.com](http://www.mdsintl.com)) is Canada's largest international health and life sciences company, with businesses including drug development, proteomics and diagnostic services. In fiscal 1999, MDS had global revenues of over a billion dollars from sales of its products and services.

"MDS is a strategic ally and we are pleased to be working with Canada's market leader to broaden access to the BRACAnalysis® molecular diagnostic

test," said Gregory Critchfield, MD, President of Myriad Genetic Laboratories, Inc. "Women at risk of breast and ovarian cancer will have the benefit of Myriad's test and MDS' superb network and relationship with physicians and hospitals which we believe will assist in the prevention and medical management of these cancers."

Under the agreement, MDS will send test requests for the comprehensive BRACAnalysis® full-sequence test to Myriad Genetic Laboratories in Salt Lake City for analysis, and will establish a service in Canada to provide individual mutation screening tests through its own network and relationships. Myriad intends to explore opportunities for additional testing services and other ways to expand its relationship with MDS.

"MDS is pleased to be working with a world leader in molecular diagnostics. Leveraging our national access to provide Myriad's genetic test for breast and ovarian cancer is an important step in our goal of helping many women and their doctors better manage, diagnose and prevent these cancers," said Alan Torrie, President and CEO of MDS Diagnostic Sector. "As a market leader, we are constantly looking for new, world class diagnostic technologies that help fight disease. Myriad is the type of company that we feel is a good fit with MDS. As our growth strategies unfold, we are confident that there will be expanded opportunities for us to work together," added Torrie

### **MYRIAD GENETICS IDENTIFIES NEW HIV DRUG TARGET**

Novel Assay for Therapeutic Target Holds Promise  
for Improved AIDS Drugs  
Salt Lake City, UT  
November 18, 1999

Myriad Genetics, Inc. (Nasdaq: MYGN) announced today that it has identified a novel drug target for the treatment of HIV. The drug target represents a new approach to treating AIDS, and may enable the creation of an entirely new class of therapeutics, distinct from the protease inhibitors or reverse-transcriptase inhibitors which are the most commonly prescribed among the current generation of HIV drugs.

The target has not been licensed to another company and represents Myriad's seventh internal drug development program. Assays for drugs that modify the target have been created in preparation for high-



throughput screening by Myriad Pharmaceuticals, Inc., the Company's wholly owned subsidiary.

"This new HIV drug target is especially exciting in that it has the potential to improve on current treatments for AIDS. With the evolution of multi-drug resistant strains of the virus comes an increased need for therapies that act through different mechanisms," said Adrian Hobden, Ph.D., President of Myriad Pharmaceuticals, Inc. "The ability to establish long-term suppression of viral activity will allow HIV-positive individuals to lead longer and healthier lives. Novel approaches such as Myriad's may well provide that extended therapeutic benefit to patients."

HIV is the seventh therapeutic area under development by Myriad Pharmaceuticals. The Company has current programs in the areas of cancer (angiogenesis), rheumatoid arthritis, atherosclerosis and chronic pain as well as sleep disorders and cognition. In September of this year, the Company announced that it had identified six new drug targets from within these program areas. High-throughput proprietary screens for small-molecule drugs have been built for all six and screening has begun on three targets. The new HIV target for drug development, as with the first six, was identified through Myriad's ProNet® technology, which discovers protein interactions, identifying key regulators of important disease pathways.

Myriad Pharmaceuticals' competitive strategy involves the discovery of novel, innovative drugs for common diseases with large potential markets that are underserved by current medical options and which have not been exploited by major pharmaceutical companies. Myriad Pharmaceuticals intends to develop promising compounds up to the human clinical trials stage, reducing the development time and cost for its future pharmaceutical company partners, and anticipates a substantial new near-term revenue source. The Company plans to partner its compounds with a pharmaceutical organization to move the drugs through the human clinical testing phase. Two of the Company's recent collaborations are structured as 50/50 profit-sharing arrangements.

Created to exploit the target-rich data flowing from the Company's ProNet® technologies, Myriad Pharmaceuticals anticipates generating a large

number of small-molecule drug leads from high-throughput proprietary drug screening of targets. The Company's facility is capable of screening 12.5 million matrixed compounds per year, to maximize the number of potential new drug compounds discovered for development.

### **MYRIAD GENETICS INTRODUCES NEW BREAST CANCER TESTING SERVICE**

Rapid BRACAnalysis® Designed to Provide Results in 7 Days

Salt Lake City, UT

November 4, 1999

Myriad Genetics, Inc. (Nasdaq: MYGN) announced today the introduction of a new rapid-turnaround service for breast and ovarian cancer susceptibility testing. Rapid BRACAnalysis® was created in response to physician demand, for use in patients recently diagnosed with breast cancer. The service, which is available now, is designed to have results back in 7 days following receipt of the specimen at Myriad. The test combines Myriad's highest-quality full-sequence testing with rapid turnaround of results.

"We are pleased to provide this service in response to surgeons and their patients newly diagnosed with breast cancer, who asked Myriad for a faster test result," said Gregory Critchfield, M.D., President of Myriad Genetic Laboratories, Inc. "These doctors and their patients use the valuable information from the BRACAnalysis® test to assist in decision making as they face important choices following a diagnosis of breast cancer. The information provided from BRACAnalysis® testing can help a woman make decisions to improve her health and quality of life."

To achieve these faster timeframes, a special parallel process is used that includes running each Rapid BRACAnalysis® specimen in duplicate through the test procedure. In addition, a dedicated technician manages the specimen to eliminate potential processing delays. The standard BRACAnalysis® service costs \$2,400, which is reimbursed by insurance. There is a supplementary charge of \$1,100 for the Rapid BRACAnalysis® service.

The BRACAnalysis® tests detect mutations in the BRCA1 and BRCA2 breast and ovarian cancer genes. Women who have a mutation in one of the



genes have a significantly increased risk of developing breast cancer and ovarian cancer. Among women with a previous diagnosis of breast cancer, a positive BRACAnalysis® test indicates a greater likelihood of a second breast cancer. In addition, the risk of ovarian cancer is substantially higher in these individuals.

Fortunately, there are new options available to prevent cancer, for an individual with a positive BRACAnalysis® test. The BRACAnalysis® test for breast and ovarian cancer susceptibility has been available commercially for more than three years. During this time, a solid clinical utility profile has emerged. A large recent study funded by the National Cancer Institute demonstrated the potential of drugs to prevent breast cancer. The study found that women at high risk of the disease were able to lower their risk by 45% by taking the drug tamoxifen. Similarly, in another study, the risk of ovarian cancer was 60% lower in women with BRCA1 or BRCA2 mutations who took oral contraceptive pills. In addition to medical decision-making, BRACAnalysis® test information is helpful for women who may be considering prophylactic surgery. For example, a negative test result can reduce an individual's likelihood of breast or ovarian cancer from the high risk due to a strong family history to a risk that is no higher than that in the general population as a whole. Unnecessary surgeries can be avoided, due to the information provided by BRACAnalysis®.

The BRACAnalysis® test has been embraced by physicians and patients alike and testing appropriate patients for hereditary breast and ovarian cancer is endorsed by medical societies such as the American College of Medical Genetics and the American Society of Clinical Oncology.

Insurers pay for the BRACAnalysis® test. Leading healthcare insurers have instituted progressive measures that provide insurance coverage of BRACAnalysis® for their qualifying members, while protecting their members' confidentiality. Myriad returns test results only to the requesting physician, securing the confidentiality of testing. Over 390 health care insurers currently pay for BRACAnalysis®, and better than 94% of patients seeking insurance reimbursement are successful. More than 800 medical centers now take advantage of the power of BRACAnalysis® for their patients at risk of breast and ovarian cancer.

Although theorized as possible early on, discrimination by health insurance companies in this area has not been documented. A recent study that interviewed genetic counselors, insurance agents, and patient advocates, and also analyzed records of 50 insurers, found no evidence of insurance discrimination. Federal legislation enacted over two years ago made raising group health insurance rates or discontinuing coverage based on genetic information illegal in the United States. To the best of the Company's knowledge, not a single case of health insurance discrimination has been documented against a woman tested for the breast and ovarian cancer genes.

### **MYRIAD GENETICS IDENTIFIES SIX NEW DRUG TARGETS**

Assays Created, High-Throughput Screens Built and Running  
Salt Lake City  
September 30, 1999

Myriad Genetics, Inc. (Nasdaq: MYGN) announced today that it has identified six targets for drug discovery and has designed proprietary assays to detect small molecule drugs modifying these targets. High-throughput drug screens have been initiated against the first three of these targets using a diverse library of low molecular weight chemical compounds in order to isolate lead compounds for further drug development.

The initial targets selected by Myriad Pharmaceuticals for screening were identified using the Company's ProNet® technology, which discovers drug targets by mapping protein interactions and identifying the members of disease pathways. The Myriad drug targets in high-throughput screening are all key regulators of important disease pathways. Myriad Pharmaceuticals is initially screening for compounds to treat cancer and rheumatoid arthritis. The Company also intends to begin screening in the near future for compounds to treat atherosclerosis, chronic pain and certain central nervous system diseases.

Adrian Hobden, Ph.D., President of Myriad Pharmaceuticals, Inc., commented on this first in a series of milestones focusing on the progress in building a high-quality, well-validated, lead-compound-generating business, "Myriad has identified its first six promising targets for drug discovery in a very short period of time. In addition, we have developed innovative high-throughput drug



screens to identify chemical compounds that modify the drug targets. The Company expects to identify and screen a large number of targets each year as part of its strategy of rapidly screening its compound collections and moving quickly on to fresh targets if quality hits are not readily found."Created less than one year ago to exploit the target-rich data flowing from the Company's ProNet® technologies, Myriad Pharmaceuticals, Inc., a wholly-owned subsidiary of Myriad Genetics, Inc., anticipates generating a large number of hits from high-throughput proprietary drug screening of targets. The Company's competitive strategy involves the discovery of novel, innovative drug targets for common diseases with large potential markets that are underserved by current medical options and which have not been exploited by major pharmaceutical companies.

The Company's strategy for developing novel pre-clinical therapeutic compounds begins with ProNet® drug target identifying capabilities. This technology dramatically increases the number of validated targets and allows Myriad researchers to screen the best targets for drug activity. The Company intends to investigate large numbers of potential drug targets, while limiting the per-target spending, to ensure that resources are dedicated only to the best of the newly discovered targets. Targets lacking high-quality hits from high-throughput screening will be discarded. High-quality hits generated in the screening process will be developed into lead compounds with the same focused, results-oriented scrutiny that will not tolerate waste of resources while building a full pipeline of drug candidates.

Myriad Pharmaceuticals plans to take compounds through the drug development process to the human clinical trials stage, reducing the development time and cost for its future pharmaceutical company partners, and expects to create substantial new near-term revenue source. Once Myriad researchers identify a promising pre-clinical compound, the Company plans to partner with a pharmaceutical organization to move the drug into the human clinical testing phases.

## **MYRIAD GENETICS DISCOVERS DIABETES GENE**

Gene Has Novel Drug Target Potential  
Salt Lake City, UT  
September 23, 1999

Myriad Genetics, Inc. (Nasdaq: MYGN) today announced the discovery of an important gene involved in the inherited susceptibility to insulin-dependent diabetes (insulin-dependence is a chief component of essentially all type 1 diabetes and a portion of type 2 diabetes). The discovery of this gene offers the potential for the development of new ways to treat insulin-dependent diabetes as well as the opportunity to develop drugs to prevent or to slow the progression of the disease. Myriad Pharmaceuticals, Inc., a wholly-owned subsidiary of Myriad Genetics, is investigating the therapeutic potential of this gene.

Additionally, children who are at high risk of developing diabetes could be identified prior to onset of the disease before any of the physical damage associated with untreated diabetes takes place. The compelling need to identify these high-risk individuals has driven the Company's Myriad Genetic Laboratories subsidiary to investigate the diagnostic opportunity represented by this gene.

"This exciting discovery demonstrates the strength of Myriad's internal research programs, which provide substantial upside potential without adding significant cost by leveraging the synergy of our partnered research programs" said Peter

Meldrum, President and CEO of Myriad Genetics. "The diabetes gene discovery represents both an exciting drug development candidate and a potential addition to Myriad's genetic testing pipeline. The Company is currently exploring the therapeutic opportunity and has entered the diabetes gene into a diagnostic product development program."

The diabetes gene was discovered through an internal Myriad research program led by Maura McGrail, Ph.D. and Donna Shattuck-Eidens, Ph.D. Based on the analysis of families with insulin-dependent diabetes, Myriad estimates that the diabetes gene may account for at least 10 - 15% of cases of insulin-dependent diabetes. The analysis of individuals that have been diagnosed with insulin-dependent diabetes showed a strong genetic linkage



to the region in which this gene was discovered, indicating an important gene was contained within the region. Candidate genes from this region were screened for mutations by sampling the DNA of affected members of families with insulin-dependent diabetes. Mutations were discovered in one of the candidate genes and have since been detected in the same gene in approximately 10 - 15% of tested individuals. Further studies of both type 1 and type 2 diabetic patients may identify additional mutations in the gene, which would increase the importance of its contribution to the disease.

Several alternative splice forms of the diabetes gene have been discovered by Myriad, which indicates that the gene products are regulated in a complex manner. The diabetes gene produces a secreted protein that is part of an elaborate regulatory cascade, although much is yet to be learned about the gene's action in diabetes. Myriad has applied for composition of matter patents on the alternative forms as well as the novel mutations of the gene and method patents on the role of the gene in diabetes.

"The discovery that this gene is altered in insulin-dependent diabetic individuals may help explain the strong genetic basis of the disease," said Donna Shattuck-Eidens, Ph.D., Vice President of Metabolic Disorder Research for Myriad Genetics. "Risk factors for insulin-dependent diabetes have been poorly understood to date but this discovery offers hope for the future development of more effective treatments and prevention measures for diabetes."

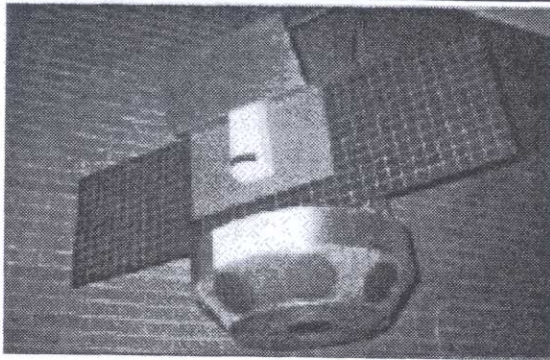
Further research is underway at Myriad Genetics to better understand the prevalence and number of mutations in the gene among type 1 and type 2 diabetic individuals. Further follow-up studies will help determine the penetrance and longer-term outcomes of individuals with gene mutations. The discovery of the gene and its role in diabetes as well as subsequent findings on the nature of the gene, will be submitted for publication in a peer-reviewed journal.

### **Background on Insulin-dependent Diabetes**

Insulin-dependent diabetes is typically diagnosed in late childhood or teenage years. The pancreas does not produce insulin, so it must be supplemented. Treatment is aimed at keeping the blood glucose level near normal at all times. A strict regimen of carefully calculated diet, physical activity, home glucose testing and multiple daily insulin injections is generally required for successful management of the disease. More than one million individuals have been diagnosed with type 1 diabetes in the United States and over 80,000 additional cases of type 1 diabetes are diagnosed every year. Approximately 10 million Americans have type 2 diabetes with another 750,000 individuals diagnosed each year.



**This is a Spin-off Company  
from the Center for Aerospace Technology  
Weber State University**



### **One Stop Satellite Solutions-OSSS**

For years, large expensive satellites were required to perform most valid scientific and commercial space missions. Today, there is a need for cost effective small satellite options. One Stop Satellite Solutions (OSSS) has developed low earth orbit satellites that have the capacity to reduce mission costs and increase mission capabilities. As a full service satellite company, OSSS provides customers with a one-stop approach to meeting their needs. Key alliances allow OSSS to provide the satellites, launch services, ground control, and data collection needed by customers. OSSS's technology and innovative design solutions make small satellites with large satellite features possible. Capabilities include:

- Receiving, storing, and transmitting data for communications
- Scientific experiments
- Space rating of parts
- Research work
- Non-real time communication applications
- Remote sensing
- Other untapped commercial applications

OSSS's mission is to provide its customers with low cost, high quality small satellites for more effective access to space. OSSS satellites use state of the art technology that has been developed by the Center for Aerospace Technology (CAST) at Weber State University with support from the Utah Centers of Excellence Program. OSSS technologies have proven space experience and can provide major cost savings compared to current industry competitors.

These technologies, combined with the OSSS management team can fulfill NASA, government, education, and commercial missions.

### **OSSS Makes Space Solutions Affordable**

OSSS utilizes CAST's innovative technologies to produce, launch, and manage small standardized or customized satellites in a price range of \$1 - \$10 million. Services and products available include:

### **SERVICES**

- Mission planning
- Design engineering
- Launch integration
- Ground station development
- Spacecraft operation

### **PRODUCTS**

- Space frames
- 3-axis stabilized control
  - torque reaction wheels
  - sun sensors
  - magnetometers
  - attitude control software
- Solar panels
- Power systems
- Flight computers

OSSS is a technology transfer company based on the research conducted by the Center for Aerospace Technology at Weber State University, in conjunction with support from the Utah Centers of Excellence Program. OSSS has licensed CAST technologies and is building upon CAST experience to design and produce standardized light-weight, low-cost satellites. OSSS will continue cooperation with CAST for research and development services.



## **The First Satellite Launch Occurred in February 2000**

The company's first satellite, called JAWSAT (for Joint Air Force Academy-Weber State University Satellite), was launched on January 26th from the Vandenberg Air Force Base (VAFB) firing range on an experimental Air Force missile; One Stop Satellite Solutions was the primary payload contractor.

The JAWSAT multi-payload adaptor served as the main structure of a payload group which included four separate satellites mounted on the adapter and designed to deploy into separate positions once the adapted had achieved stable orbit. It also served as the platform for a NASA/Marshall Space Flight Center experiment to help validate a new method of studying electrified gases in space, and the OSS/WSU attitude controlled platform.

The integration and launch of the five separate satellites were 100% successful. Six objects (five satellites plus the fourth stage of the launch vehicle) are now traveling in the expected orbit.

The four orbiting satellites deployed from the JAWSAT Adapter are as follows:

1. FalconSat is designed to study how electrical charges build up on spacecraft in low earth orbits, is operating normally.
2. Opal (Orbiting PicoSat Automated Launcher) carries and launches six very small satellites (about the size of a bar of soap or a deck of cards). The emphasis for this payload is on demonstrations of communications capabilities of very small satellites. Opal is operating normally.
3. The Optical Calibration Sphere (OCS) is a Kapton/aluminum balloon used to calibrate an experimental telescope. OCS has reported normal operation.
4. ASUSAT was designed and built by ASU students to be launched as a technology demonstrator for low-cost spacecraft. The satellite was placed in a low-earth polar orbit to provide earth imagery, an audio transponder for amateur radio operations and a proof of concept for many new components.

**This is a Spin-off Company  
from the Center for Cell Signaling  
University of Utah**



Research Laboratories Inc.

**ECHELON RESEARCH LABORATORIES INC.  
RECEIVES FEDERAL GRANT FROM THE  
NATIONAL INSTITUTES OF HEALTH**

Salt Lake City, Utah  
June 13, 2000

Echelon Research Laboratories Inc. is pleased to announce that it was awarded a Phase II Small Business Technology Transfer (STTR) grant from the National Institutes of Health (NIH). This two-year grant provides Echelon with over \$500,000 to develop specific tools for the study of cancer. Dr. C. Dale Poulter, Vice-President of Research, will be the principal investigator for the project. Dr. Poulter is also Distinguished Professor and Chairman of the Department of Chemistry at the University of Utah.

This grant provides funding to develop chemical compounds that are used in developing anti-cancer drugs and in the basic research of cell signaling events that lead to cancer. Because of this grant, Echelon will be able to provide scientists with chemicals and enzymes to facilitate their cancer research.

This current phase II grant is the eighth project the NIH has funded for Echelon. In 1999 the U.S. Small Business Administration selected Echelon Research Laboratories to receive the Tibbetts Award to recognize the company's contribution to the Small Business Innovative Research Program.

"Echelon has developed significant expertise in the process by which cells respond to signals in their environment. This NIH grant will allow Echelon to expand its product line of cell signal molecules and other tools for the study of cancer," said G. Thomas Heath, President.

Echelon Research Laboratories is a privately owned

research company located adjacent to the University of Utah and is a corporate sponsor of the Center for Cell Signaling, a Utah Center of

Excellence supported by the State of Utah to foster the commercialization of new university-derived technologies.

**ECHELON RESEARCH LABORATORIES INC.  
RECEIVES PRESTIGIOUS TIBBETTS AWARD**  
Washington D.C.  
October 26, 1999

Echelon Research Laboratories Inc. (ERL), headquartered in Research Park near the University of Utah received today a prestigious U.S. Small Business Administration "Tibbetts Award" at ceremonies held in Washington, DC. Mr. G. Thomas Heath, President of ERL, accepted the award on behalf of the Company. Named for Roland Tibbetts, the person universally acknowledged as the father of the Small Business Innovative Research (SBIR) program, these national awards are made annually to recognize superior SBIR technological innovation, economic impact, and business achievements. ERL is the only company in Utah to receive the Tibbetts Award this year.

ERL was awarded two SBIR grants in 1999 and received two prior awards in 1998. The first 1999 award, funded by the National Cancer Institute, will allow ERL to develop assays or tests to monitor production in cells of powerful molecules known to block the process of cell death, called apoptosis. These assays are forerunners of a new clinical diagnostic method for early detection of pre-metastatic malignancies. The second award, granted by the Institute of General Medical Sciences of the National Institutes of Health (NIH), provides funding to develop a rapid, high-throughput screening assay to identify products that will inhibit the production of these 'cell death' molecules.

ERL was incorporated in 1997 by Mr. Heath and University of Utah Professors Glenn D. Prestwich and C. Dale Poulter, with assistance from the Center for Cell Signaling, a Utah Center of Excellence. The Company's focus is cell signaling - the molecules and



processes by which cells communicate and respond to their environment. The Company developed a product line of specific cell signaling molecules, and over 100 research laboratories have now purchased these products. ERL products have now been referenced in a number of scientific papers and have served to increase the general knowledge and understanding of cell signaling.

Since the passage of SBIR legislation in 1982, over 40,000 SBIR programs have been funded, and over 3,500 are added annually. Of the many participants in the SBIR program, only about 60 companies are awarded a Tibbetts each year, putting ERL in the top 1% of achievers. For more information about the Tibbetts Award see <http://www.innovation.com/cgi-bin/db4/Tibbetts/WelcomeT.html>

#### **ECHELON RESEARCH LABORATORIES INC. RECEIVES A FEDERAL RESEARCH GRANT TO DEVELOP CANCER SCREENING TESTS**

Salt Lake City, Utah

August 1, 1999

Echelon Research Laboratories Inc. (ERL) is pleased to announce that it was awarded a federal grant to develop tests for the early identification of cancer cells in human tissues. This grant, a Small Business Innovation Research (SBIR) grant, was awarded by the National Institutes of Health (NIH), and it provides ERL with over \$200,000 in research funding over the next two years.

Dr. Deborah W. Neklason, Manager, Biochemical Assay Products at ERL will be the principal investigator for the project. Dr. Neklason received her doctorate degree from the University of Utah in Human Genetics.

"Echelon Research Laboratories has developed rapidly over the past two years, and now has significant technical expertise in the synthesis of molecules involved in cellular communication. This award is the fifth small business grant the company has received from the NIH in the past two years," said Dr. Glenn D. Prestwich, Vice President of Research at ERL. "We have identified an important market niche for research and diagnostic reagents, and our plans now include drug discovery and diagnostic tests," added Dr. Prestwich.

The technology being developed with the support of the grant will allow screening to identify possible diagnostic changes indicative of cancer in the prostate, breast, colon

and other tissues based on biochemical markers. Tissues will be obtained in cooperation with University Hospital at the University of Utah and the Huntsman Cancer Institute.

#### **SALT LAKE FIRM RECEIVES FEDERAL RESEARCH GRANT FROM THE NATIONAL INSTITUTES OF HEALTH**

Salt Lake City, Utah

July 1, 1999

Echelon Research Laboratories Inc. (ERL) is pleased to announce that it was awarded a Small Business Technology Transfer (STTR) Phase II grant from the National Institutes of Health (NIH). This two-year grant provides ERL with over \$500,000 to develop specific cell signaling assays expected to be valuable in the study of cancer and diabetes. Dr. Glenn D. Prestwich, Vice-President of Research, will be the principal investigator for the project. Dr. Prestwich is also Presidential Professor and Chair of the Department of Medicinal Chemistry at the University of Utah.

"This NIH grant recognizes that Echelon Research Laboratories has the capability to develop and produce tools valuable to the scientific research community," said G. Thomas Heath, President.

ERL was formed in 1997 and specializes in chemicals shown to play a critical role in the processes by which cells communicate. In April 1998 ERL began distributing specific cell signaling products to scientists in the US, Europe and Asia. The NIH previously awarded ERL four phase I STTR and Small Business Innovation (SBIR) grants to study various aspects of cellular communication.

ERL will develop assays for early cancer detection and for determining the potential of specific cancer cells to metastasize. Each assay employs reagents uniquely produced by ERL. Biochemists at ERL have already been successful in developing antibodies to several molecules, a major milestone in assay development.

ERL is located in Research Park adjacent to the University of Utah and is affiliated with the Center for Cell Signaling, a center of excellence program started by the State of Utah to foster the development of technology.



**This is a Spin-off Company  
from the Center for Signal Processing  
Brigham Young University**

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Based in Salt Lake City, **SONIC innovations** designs, manufactures and markets advanced digital hearing aids designed to provide the highest levels of satisfaction for hearing-impaired consumers. Capitalizing on a new understanding of human hearing, the company has developed patented digital signal processing (DSP) technologies and embedded them in the smallest, single-chip DSP platform ever installed in a hearing aid. This technological advantage helps set a new standard for consumer satisfaction and delivers more natural sound than competing hearing aids. **SONIC innovations'** products include NATURA and CONFORMA hearing aids.

Powered by the smallest, most powerful chip ever embedded in a hearing aid, **SONIC innovations'** NATURA allows many hearing-aid users to regain a more complete communication experience with a highly personalized hearing aid that more closely mimics the action of the inner ear. NATURA processes sound at a rate 50% - 90% faster than traditional hearing aids-allowing NATURA wearers to hear virtually at the speed of sound. NATURA delivers an unprecedented level of personalization by breaking the world of sound down into more than twice as many distinct channels as other popular hearing aids on the market. Using a 3Com PalmPilot, the aid is individually configured by a hearing care professional to the unique needs of the wearer to make sure that, for every user, sounds within each half-octave frequency range are amplified appropriately in the right contrast to sounds in every other channel. The result: A more lifelike communication experience for the hearing impaired.

**SONIC innovations** was founded to capitalize on digital recording and signal processing technologies developed by Dr. Douglas Chabries, Dean of the College of Engineering and Technology at Brigham Young University, Dr. Thomas Stockham, a pioneer in the field of digital recording and Dr. Carver Mead of the California Institute of Technology.

Dr. Chabries is an internationally recognized authority on digital speech processing. Prior to joining BYU, Dr. Chabries headed a U.S. Navy laboratory, where he researched and designed underwater acoustic signal processing technologies. He has participated with the National Academy of Science panel on noise suppression for speech intelligibility and holds 10 patents in the areas of adaptive signal processing and digital hearing enhancements.

Dr. Stockham is widely regarded as the "father of digital recording" and is credited with making the first digital recording in 1976. Dr. Stockham launched digital music recording and editing that led to the production of compact disks (CDs) and CD players. He has won Emmy and Grammy awards for his pioneering role in the development of digital recording.

Dr. Mead is the California Institute of Technology's Gordon and Betty Moore Professor of Computer Science and is an ongoing technical advisor to SONIC innovations. He joined with Drs. Chabries and Stockham to miniaturize the technology and further develop it for specific application to the human auditory system. Dr. Mead is a pioneer in the development of very large scale integrated (VLSI) circuit technology. In 1990, he won the Institute of Electronic and Electrical Engineers (IEEE) Signal Processing Society Best paper Award for "An Analog Electronic Cochlea."

Much of the core technology used in SONIC innovations' unique hearing aids was developed at Brigham Young's Center for Signal Processing in the early 1990's with funding from the Utah Centers of Excellence Program.

## **Expansion Into the European Market**

On November 30, 1999 SONIC innovations, Inc. announced the growth of its operations in Europe with headquarters in Copenhagen, Denmark to market the Company's proprietary hearing aid technology. Through its European headquarters, SONIC innovations now serves customers and distributors in Austria, Belgium, Denmark, France, Germany, Hungary, Italy, Netherlands, Spain, Switzerland, China, Sweden, Norway, Finland, Israel, South Africa and the United Kingdom. SONIC innovations' Quality System has been certified against the global Quality Assurance Standards ISO9001, EN46001, and the European Medical Device Directive, allowing the company to ship CE marked product. SONIC innovations' European division is managed by industry veteran Jakob Skadegaard and currently employs 30 people in its Copenhagen headquarters and offices in Germany and Belgium.

## **SONIC innovations Public Stock Offering**

On May 9, 2000 SONIC innovations, announced the closing of its initial public offering of 3,600,000 shares of common stock at a price of \$14.00 per share, all of which were offered by SONIC innovations, Inc. In addition, the underwriters (Goldman, Sachs & Co., Deutsche Banc Alex. Brown and U.S. Bancorp Piper Jaffray) exercised their overallotment option to purchase an additional 540,000 shares of common stock at a price of \$14.00 per share from the company. The company received total net proceeds, including the exercise of the over allotment, of \$53.9 million.

To learn more about SONIC innovations, visit [www.sonici.com](http://www.sonici.com)

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III.

### **FUNDED CENTERS**





# CENTER FOR ADVANCED JOINING OF MATERIALS

## CENTER

The Center for Advanced Joining of Materials (CAJM) is developing new enhancements and technologies for Friction Stir Welding that offer several advantages and improvements. FSW is a relatively new and innovative joining technology that is revolutionizing the way aluminum and copper materials are joined. The objective of the CAJM center is to develop enhancements to the existing technology that will broaden the use of this process in new materials and applications.

## TECHNOLOGY

Friction Stir Welding (FSW) is a process by which materials are joined by stirring the materials along the joint line in a low-temperature, continuous process that produces extremely strong welds without adding materials or stressing the joint with high temperatures. The process, which is not owned by BYU, has wide industry applications potential but has been hampered in its development by problems of tool life and difficult process control. The Center is focused on the development and marketing of three key enabling technologies: 1) tooling that will last longer, join a wider range of advanced materials, and enable better control of weld quality and properties; 2) new control systems and hardware for large, three-dimensional FSW capabilities; and 3) new methods and tooling for joining polymeric (plastic) materials.

## ACCOMPLISHMENTS

The center has accomplished all of its first year milestones. These include the design, manufacturing and testing of new tool designs and materials, the selection of appropriate tool materials, defining the correct control parameters for process optimization, integrating software controls for process parameters, the securing of intellectual property, and the definition of commercialization paths. Three provisional patents have been submitted covering the use of superabrasive tools, welding of polymetric materials, and methods of controlling machine tools and transferring machine data. An exclusive license covering the superabrasive tooling has been issued to a Utah company. A demonstration conference was held in May in which several large companies were shown a prototype of the FSW tooling in operation. Companies attending included Ford Motor, Boeing, Intel, and Aries (Japan). Significant interest in the technology was shown and the companies are anxious to implement the tooling methods. The center is seeking a business partner, likely a new start-up, through which the technology can be licensed and marketed.

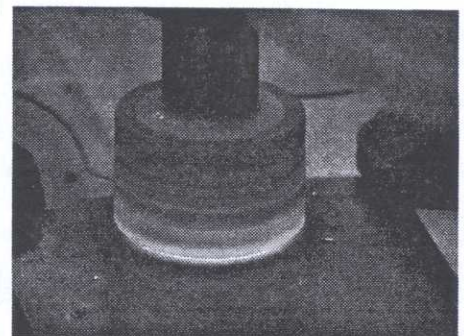
## CONTACT

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*Can You Imagine...*

A new method for welding metals and plastics that does not melt the materials, does not add new material, and forms a joint that is very strong and virtually undetectable from the surrounding materials?

THE CENTER FOCUSES ON DEVELOPING TOOLS AND PROCESSES USING AN ADVANCED JOINING TECHNOLOGY CALLED "FRICTION STIR WELDING"



Friction stir welding in a nickel-based alloy: The tool developed is capable of withstanding the temperature and stresses imposed in joining high strength materials. The picture shows the tool being tested at a temperature of 1300C. As a result of Center success, the Welding Institute in England has partnered with BYU and Advanced Metal Products (company making the tools) in Bountiful to fund the continued development and market these tools.



# CENTER FOR ADVANCED STRUCTURAL COMPOSITES

## CENTER

The Center for Advanced Structural Composites was first funded in 1998 to develop the commercial potential of fibre reinforced composites by improving the strength, stiffness, damping, and acoustical performance of structures manufactured using advanced composite materials.

## TECHNOLOGY

The core technologies consist of a damping enhanced wavy composite material system, and an ultra-lightweight composite structural shape known as the "IsoTruss". The wavy composite material utilizes carbon fibers layered in sinusoidal patterns on laminated material to enhance acoustic damping characteristics without compromising strength or stiffness. The IsoTruss structure is made of carbonfibres wound in a complex geometric pattern and stabilized through an epoxy cure cycle. The resulting lightweight structure exhibits extreme rigidity and torsional strength. The technology has the potential for various functional applications including aerospace, automotive, support towers, heavy construction support members, and preformed concrete beams.

## ACCOMPLISHMENTS

Last year, a new business, Patterned Fibre Composites, Inc., was established with license rights to produce products using the damped wavy composite technology. The company was awarded a \$950,000 Phase II SBIR contract from the USAF to commercialize the technology. With the licensing of this technology, the Centers' focus was moved primarily to the IsoTruss technology. Significant analysis work was completed on the 6 node IsoTruss configuration and one patent was issued. Additional configuration designs are underway with additional patents being prepared for filing. Industrial interest in the IsoTruss continues to be high and prototype designs are being evaluated. Contemplated applications include lightweight bicycle frames, freeway sign supports, tilt-up wall braces for construction, and powerline support towers.

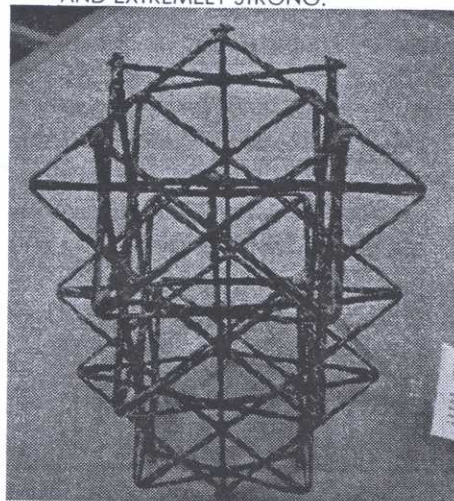
## CONTACT

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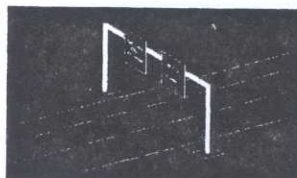
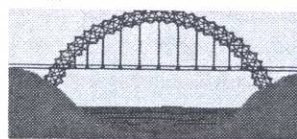
*Can You Imagine...*

... a powerline transmission tower that can withstand extreme wind conditions, support tremendously heavy loads, is corrosion free, is unaffected by temperature extremes, and weighs significantly less than conventional steel towers.

THE CENTER DEVELOPS FIBRE  
REINFORCED COMPOSITE MATERIALS  
AND STRUCTURAL DESIGNS THAT ARE  
LIGHTWEIGHT, STRUCTURALLY RIGID,  
AND EXTREMELY STRONG.



An example of the IsoTruss structure that provides extreme rigidity and torsional strength in a very lightweight configuration.



Some anticipated applications for the IsoTruss technology.



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## CENTER FOR ASYNCHRONOUS CIRCUIT AND SYSTEM DESIGN

### CENTER

The Center for Asynchronous Circuit and System Design was established in 1997 to complete the development of software design tools that will allow engineers to efficiently design digital circuits that do not require a global clock in order to operate.

### TECHNOLOGY

While most of today's digital systems use a synchronous global clock to coordinate operations within an integrated circuit, the challenge of distributing such global clock signals becomes increasingly difficult as circuit densities increase. Asynchronous circuits do not require a global clock and therefore do not require clock distribution lines as traditional synchronous circuits do. Industry has not moved to asynchronous design in large part owing to a lack of computer aided design (CAD) tools supporting this technology. Meeting this need is the direct target of this Center. This Center is working with companies such as Intel and IBM not only to help solve their future asynchronous design problems, but also their current difficulties in the analysis and verification of high-speed integrated circuits.

### ACCOMPLISHMENTS

The Centers' first patent application representing nearly 100 claims has been filed and is in process at the US Patent Office. Significant design verification work was completed at IBM's Austin Research Laboratory, which has resulted in a non-exclusive license agreement with IBM to evaluate the Center's analysis tool in IBM's design flow. The center continues its collaboration with Sonic innovations, a Utah company, designing digital hearing aids. The Center is designing an asynchronous version of their hearing aid that will significantly reduce circuit size and power consumed. Last year, a new grant was received from the National Science Foundation to explore mixed analog/asynchronous architectures for digital communications. They have designed a test chip that has recently returned from fabrication.

### CONTACT

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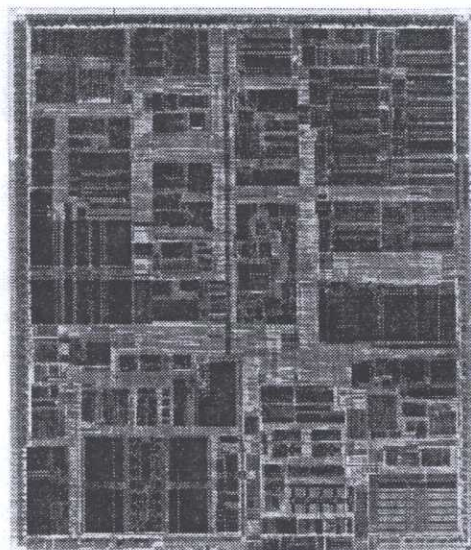
*Can You Imagine...*

...a personal computer that runs significantly faster than today's models because it does not depend on an internal clock to synchronize its various operations?

THE CENTER DEVELOPS DESIGN

TOOLS FOR DIGITAL ENGINEERS

CREATING NEW MICROPROCESSORS



The Intel P6 400 MHz microprocessor as seen through a microscope. Up to 30% of the surface area of a high speed microprocessor chip may be required to distribute clocking signals. (Photo courtesy of Intel Corporation)



# CENTER FOR BIOMEDICAL OPTICS

## CENTER

Established in 1999, to commercialize optical technologies for diagnostic and therapeutic treatments in biomedicine, the Center for Biomedical Optics capitalizes on recent advances in laser materials and laser spectroscopy.

## TECHNOLOGY

The Center develops new optical and laser instrumentation to detect specific chemicals (e.g. carotenoid antioxidants) in human tissue. Concurrently a new method for optical imaging is being developed. A specialized laser radiation technique is being developed to treat certain cancers.

## ACCOMPLISHMENTS

A new prototype has been designed and fabricated to detect antioxidant molecules in human skin. Preliminary clinical studies in cancer patients were completed. Subsequent clinical trials at the Huntsman Cancer Institute Melanoma Clinic are in progress. Future cancer targets for diagnosis include oral and cervical cancers.

**One patent application has been filed and two inventions have been disclosed.**

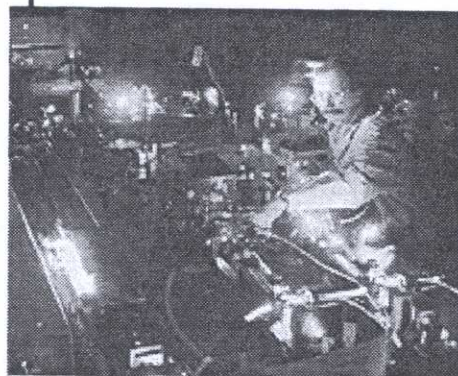
## CONTACT

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*Can You Imagine...*

... a non invasive optical laser technique to detect and treat cancerous cells in the skin or mucosal tissue.

THE CENTER DEVELOPS OPTICAL AND LASER INSTRUMENTATION FOR VARIOUS NON-INVASIVE DIAGNOSIS OF SPECIFIC CHEMICALS IN TISSUE AND CANCER CELLS



The picture shows a laboratory scale laser instrumentation being developed at the Center.



# CENTER FOR BIOMOLECULAR TECHNOLOGIES

## CENTER

The Center for Biomolecular Technology was established in 1998 to develop and commercialize technologies aimed at (1) improving the efficiency of detecting rearrangements in the human genome and (2) reducing the high cost of genetic microarrays, i.e., "gene chips" or "biochips", which are ideally suited to unraveling complex genetic information. The versatile biochip technology could be used to detect almost any micro-object including DNA fragments, proteins, nutrients or pathogenic microorganisms.

## TECHNOLOGY

To improve the efficiency of detecting genetic rearrangements, the Center technology is focused on the development of proprietary reagents, methods, and kits that permit the bulk isolation and quantification of DNA with either specific or random rearrangements from, e.g., a small blood sample. This technology promises to replace the present methods, such as fluorescence microscopy and polymerase chain reaction (PCR) analyses, in the detection of such rearrangements.

To reduce the cost of commercial microarrays, the Center technology is focused on developing devices ("biochips") and reagents for the detection of DNA, proteins, cells, or other small objects by developing low-cost, disposable biochips. Each biochip may have hundreds of thousands of uniquely addressable microlocations. The Center's novel proprietary approach provides an opportunity for substantial cost reductions in the microarray technology along with significant enhancements in user applications.

## ACCOMPLISHMENTS

The Center's efforts during the first two years were principally focused on the development of model systems, proof-of-principle demonstrations, and on disclosures and patents to secure these proprietary technologies. Initial model systems were developed and successfully tested for both technology types. One provisional patent application has been filed and two inventions have been disclosed.

A new spin-off company, GenMetrix LLC, has been formed to commercialize the DNA

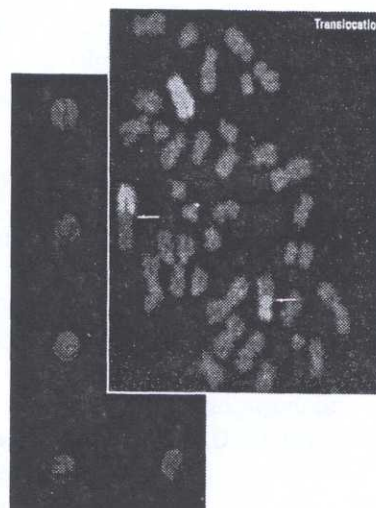
## CONTACT

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*Can You Imagine...*

... being able to identify potential inheritable genetic disorders to provide appropriate medical/genetic counseling; and being able to detect a myriad of specific molecules on biochips?

THE CENTER WAS ESTABLISHED TO DEVELOP IMPROVED TECHNOLOGIES TO EVALUATE DNA DAMAGE AND CHROMOSOME REARRANGEMENTS AND DEVELOP NEW COST-EFFECTIVE BIOCHIPS



The Center technology would eliminate the need for costly cytogenetic analyses to detect chromosome rearrangements such as the translocation identified in the above microscope image (modified from Straume et al. 1992). Instead, the Center's proprietary reagents and methods are used to extract and quantify such events directly from bulk samples of cells. Also shown above is a small part of a test array consisting of proprietary reagents with properties that permit efficient positioning and detection. The array agents, together with special array devices, are designed to actively transport DNA proteins, cells, or other small objects into low-cost, disposable microarrays.



# CENTER FOR CELL SIGNALING

## CENTER

The Center for Cell Signaling was established in 1997 to identify new therapeutic targets and of new drug candidates for asthma, allergy, inflammation, and cancer. Each of these diseases arises because cells are communicating the wrong information, which can be fixed by disrupting incorrect messages and providing correct signals. The Center now has 21 participating faculty members from eight different departments at the University of Utah, 1 from BYU and 2 from USU, focusing their talents in a synergistic way to create and commercialize new technologies.

## TECHNOLOGY

The Centers' technologies focus on the synthesis and drug applications of new molecules involved in cell-cell communication, from controlling the biochemical pathways of signal transduction to designing instruments used to study these processes. Current developments include tools necessary for the elucidation of chemical pathways that regulate normal and abnormal cell responses. These tools include chemical synthesis, expression of recombinant proteins, preparation of monoclonal antisera, biomolecular interaction analysis, and phage display of high affinity peptides. New methods are being developed to assay for signal binding and processing proteins, utilizing high throughput screening.

## ACCOMPLISHMENTS

The Center faculty continues to excel in inventions - this year they filed 28 new invention disclosures and four full or provisional patents. So far two companies have been spun off from the Center. **Salus Therapeutics, Inc.**, (established in 1999) focuses on identifying ribozyme and antisense targets for specific diseases. The company has research collaborations with the Center and has received two SBIR awards for over \$850,000. **Echelon Research Laboratories**, spun-off in 1998 from the Center, markets reagents and kits for identifying oncogene activators and suppressors important in cancer diagnosis. The company also has R & D collaborations with the Center; received six SBIR/STTR awards for a total of over \$2 million, and has successfully licensed Center technologies, which are now in production.

## CONTACT

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## Can You Imagine...

... a new class of pharmaceuticals that provide therapeutic effects by artificially signaling selected cells in the body to perform desired actions to the benefit of the patient?

THE CENTER DEVELOPS AND COMMERCIALIZES NEW TECHNOLOGIES FOCUSED ON THE TREATMENT OF CANCER, ALLERGY, ASTHMA AND INFLAMMATION.



Delivery of the phosphoinositide signaling molecule phosphatidylinositol 4,5-bisphosphate (fluorescently tagged green) and its carrier, histone (red), into NIH 3T3 fibroblast cells. Yellow regions indicate co-localization of both compounds (image courtesy of Joseph C. Shope). These images represent the science featured in a Proceeding of the National Academy of Sciences article entitled *Intracellular Delivery of Phosphoinositides and Inositol Phosphates Using Polyamine Carriers*, by S. Ozaki, D. DeWald, J. Shope, J. Chen, and G.D. Prestwich, which was published in October 2000. The study of cellular phosphoinositide signaling events exemplifies the strong collaboration between CCS members Prestwich at the University of Utah and DeWald at Utah State University.



# CENTER FOR COMPLIANT MECHANISMS

## CENTER

The Center for Compliant Mechanisms (CCM) designs methods to accelerate and streamline the development and commercialization process of compliant mechanisms so that they may be quickly licensed to existing or new companies. The use of innovative and patented compliant mechanisms gives companies a clear competitive advantage and will provide unique and valuable products for new companies. It is anticipated that as the design technologies mature, a new Utah company could be formed to provide contract mechanical design services to a wide variety of clients. The potential market applications and opportunities are immense.

## TECHNOLOGY

Compliant mechanism technology produces mechanical parts that are simpler, less costly and more wear resistant than conventional designs. A classic example is the flip top on a shampoo bottle. The part is bistable (exists in one of two states, open or closed), is injection molded in a one-step process, does not fail after millions of operations, and costs a fraction of the price of older devices. The CCM center focuses on defining the design methodologies for such mechanisms to reduce development time and assure rapid commercialization. The center has designed and licensed a number of such mechanisms and will continue to develop and license products. Designs completed to date include devices for power transmission, bistable mechanisms, parallel motion mechanisms, constant force mechanisms, and microelectromechanical systems (MEMS).

## ACCOMPLISHMENTS

The center has licensed two products during the year: a compliant parallel brake mechanism licensed to Tektro, a Taiwanese company, and an ortho-planar spring license granted to Flowserve, a Utah company. In addition, design work has been completed on a compliant bicycle derailleur, a silicon die transport tool, a centrifugal clutch, and an over-running clutch. Design work is underway on a constant-force robot end-effector, a bistable switch application for a Utah irrigation products company, and a series of MEMS devices. The MEMS research has advanced much more rapidly than anticipated and is close to producing commercializable products. Six provisional patents have been filed during the fiscal year.

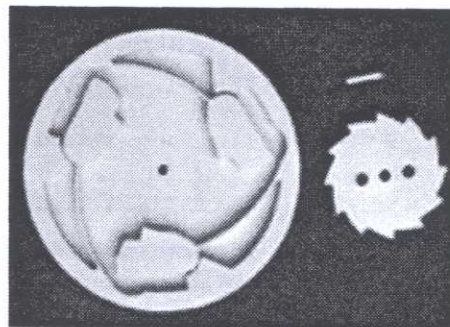
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## *Can You Imagine...*

A method for redesigning any complex mechanical part to significantly reduce the numbers of parts, simplify the manufacturing process, reduce costs and end up with a more reliable and wear resistant device?

THE CENTER DEVELOPS/DESIGNS METHODS TO ACCELERATE AND STREAMLINE THE DEVELOPMENT AND COMMERCIALIZATION PROCESS OF COMPLIANT MECHANISMS



A compliant overrunning clutch, which illustrates the part-count reduction that can be achieved using compliant mechanisms.



# CENTER FOR DAIRY TECHNOLOGY COMMERCIALIZATION

## CENTER

Established in 1998, the main goal of this center is to commercialize technologies developed at the Western Dairy Center, whose research is funded by a consortium of dairy food companies, for a variety of applications in the dairy industry.

## TECHNOLOGY

The Center is currently pursuing commercialization of the following inventions: utilization of bacterial cultures that produce polysaccharides externally to increase cheese yield; production of flavored cheese using high pressure injection technology; using textured whey protein both as a meat extender and as a high protein snack food.

## ACCOMPLISHMENTS

Three patent applications are currently pending in the following research areas: dried milk mineral fraction as an antioxidant; textured whey protein product and method; manufacture of lower fat and fat free pizza cheese. One patent was issued: **Broadbent J. #5,677,166. Compositions and Method for Phage Resistance in Dairy Fermentations.**

A license to produce and sell *Brevibacteria* was issued to DSM Food Specialties, Millville, UT. A new company was started: *Shepherds Goat and Sheep Products, LLC*, Tooele, UT.

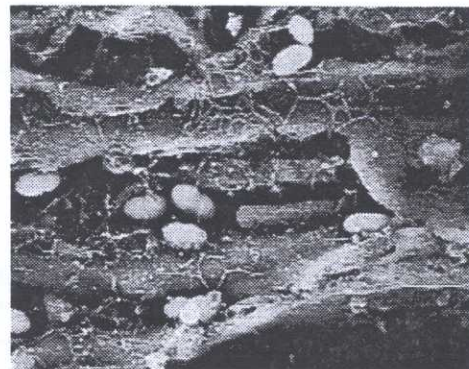
## CONTACT

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*Can You Imagine...*

... using low-fat or fat free cheese in your pizza?  
Adding value to existing dairy products, e.g. whiter skim milk, flavors to cheeses; and new uses for dairy byproduct, e.g. whey proteins?

THE CENTER COMMERCIALIZES  
TECHNOLOGIES DEVELOPED BY THE  
WESTERN DAIRY CENTER WHOSE  
RESEARCH IS FUNDED BY A  
CONSORTIUM OF FOOD COMPANIES.



Electron micrograph of mozzarella cheese



# CENTER FOR ELECTRONIC MEDICAL EDUCATION

## CENTER

Established in 1999, to commercialize image intensive applications software created by the Electronic Medical Education Resource Group, for use by medical institutions and practitioners via the internet as a resource for medical reference and education.

## TECHNOLOGY

The Center continues the development of software to streamline the use of image intensive teaching and reference data in medicine. The software consists of author and platform tools used to create medical reference and education products as part of a component based information management and processing system. The software tools will be used by both authors and end-users to continuously update the medical reference image data.

## ACCOMPLISHMENTS

Two invention disclosures were filed with the technology transfer office for copyright protection. The development and testing of existing software modules and several new modules (author tools) is in progress. The co-directors were appointed to the Radiological Society of North America Advisory Committees to study component based medical information management. A spin-off company is in the initial stages of formation. Dr. Harnsberger was awarded a Centennial Fellowship grant from RSNA to develop the standard nomenclature for use in a digital image archive systems.

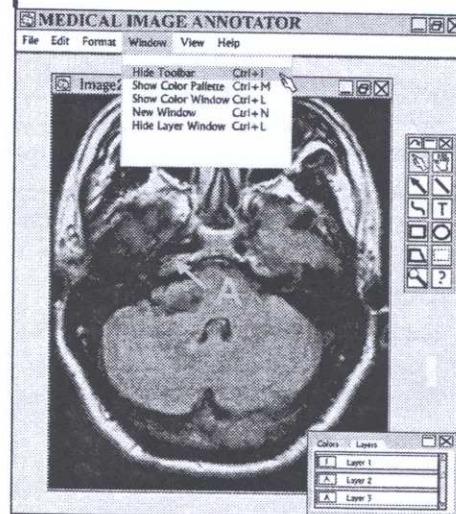
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## *Can You Imagine...*

... a medical doctor who comes across a case he has not seen before and being able to tap into a medical image database, from anywhere in the world, to access the most current database of images and case studies, to help improve patient diagnosis

THE CENTER DEVELOPS SOFTWARE FOR USE BY AUTHORS AND END-USERS TO CREATE IMAGE INTENSIVE MEDICAL REFERENCE AND EDUCATION PRODUCTS, WHICH WILL BE AVAILABLE THROUGH THE INTERNET



An example of a medical reference image being edited and stored for future access.



# CENTER FOR HARSH ENVIRONMENT ELECTRONICS

## CENTER

The Center for Harsh Environmental Electronics (formerly the Center for Flat Panel Displays) was established in 1995 to develop micro-miniature thermionic vacuum emitter (MTV) display panels. As the MTV technology has matured and initial option to license agreements were signed, the center has moved its focus to electronic circuits and devices for operation in high temperature operating environments.

## TECHNOLOGY

Harsh Environment Electronics is focused on the development of harsh environment electronics systems such as gallium arsenide-based electronics that operate at high temperatures, MTV electronics, and MTC electrical converters. The center also provides services in the following areas: prototype development and testing; development of high-temperature electronics based on MTV electronics technology; development of tools to test and evaluate flat panel display technologies; and work with industry (especially businesses located in Utah) in addressing and supporting their flat panel display technology needs. An enhanced flat panel display has been patented. A new company has been established with an option to license the flat panel display technology.

## ACCOMPLISHMENTS

The Center has continued collaboration with its first spin-off company in the development of the MTV flat panel display. The technology will compete in a huge world-wide market for displays and has great economic potential. A second spin-off, Innosys, was founded during the year and will continue the Center's work in harsh environment electronics. The Center for Harsh Environment Electronics was graduated at the end of the 2000 fiscal year.

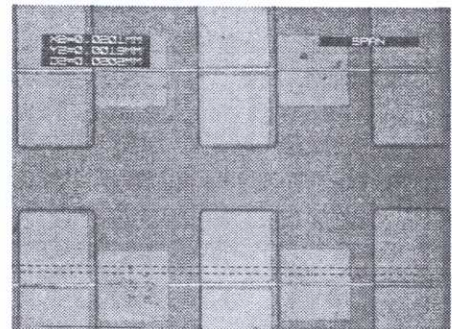
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*Can You Imagine...*

...electronics that operate at "red hot" temperatures which are highly efficient, high speed, reliable, and can be mass produced at low cost?

THE CENTER EXPLORES ELECTRONIC CIRCUITRY THAT WILL OPERATE RELIABLY IN EXTREME HIGH TEMPERATURE ENVIRONMENTS.



The picture is an array of high temperature gallium arsenide (GaAs) metal emitter field effect transistors (MESFETs).



# CENTER FOR INTELLIGENT COMPUTER TOOLS

## CENTER

The Center for Intelligent Computer Tools was first funded in 1996 to facilitate the creation of computer tools including interactive image segmentation and composition, automated creation of digital (microfilm) libraries, and semi-automated creation of virtual environments from real world images.

## TECHNOLOGY

The technology development effort is concentrated in the following areas: intelligent scissors / paint which performs image segmentation and composition; color quantization and dithering, which represents full color images with limited palette and no visual loss; resolution enhancement, making bad images good and good images better; document understanding – parsing document components and recognizing content; automated morphing between images for animation, video compression etc.; virtual environments to create realistic virtual environments from real world images and direct surface rendering; image blending for automatic shape blending and image object blending.

## ACCOMPLISHMENTS

Algorithms for intelligent paint segmentation and localization were updated with high level visual effects. The prototype digital microfilm parser / browser was enhanced with significant new tools. The virtual environment terrain database for the Virtual Olympics was expanded and terrain details such as buildings and ski runs were added. Additional license agreements were signed with Adobe Systems, Park City Entertainment, the LDS Church, and S3 Corporation

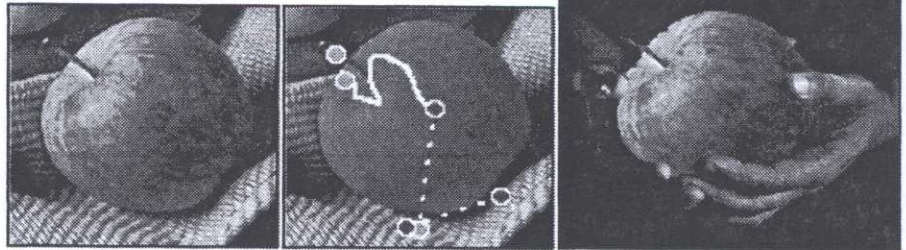
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## *Can You Imagine...*

... careening down an Olympic bobsled run, fully aware of the twisting turns and angles of the sled, while watching the surrounding landscape rush by, all on the screen of your computer with every visual sensation artificially created by software.

THE CENTER DEVELOPS INTELLIGENT  
COMPUTER TOOLS FOR THE  
CREATION, MANIPULATION, AND  
PRESENTATION OF DIGITAL IMAGES.



Intelligent Paint starts by pressing the mouse button on one side of the object to be extracted (middle frame). The mouse is then dragged to the opposite side of the object and released. The "painted" object can then be pasted into another picture (right frame).



# CENTER FOR NEURAL INTERFACES

MO

## CENTER

Established in 1995, the Center for Neural Interfaces transforms the neuroprosthetic technologies developed by the Moran Center for Applied Visual and Neural Science into prototype systems that will subsequently be commercialized for use in neuroscience research and clinical application, e.g. limited restoration of vision in the blind, or a command interface for spinal cord injured individuals.

## TECHNOLOGY

The Center is focused on the development of technologies that will permit bi-directional (i.e. stimulation and recording) communication with large numbers of neurons in the central and peripheral nervous systems. The Center has successfully developed silicon-based arrays of microelectrodes that can either listen in on or talk directly to hundreds of neurons simultaneously. The center has developed surgical tools and techniques that allow these high-density microelectrode arrays to be implanted in central and/or peripheral nervous systems. It has also developed data acquisition systems that permit the large amounts of data recorded by these microelectrode arrays to be stored and analyzed in PC-class computers. It has written software that is used to acquire and analyze these neural signals. The long-range goal of the Center is to use these new neural interfaces as therapies for disorders of the nervous system e.g. limited, but functional sensory restoration in individuals with profound blindness or deafness, and enhanced motor function to individuals with high spinal cord injuries.

## ACCOMPLISHMENTS

The Center has commenced the implantation of the microarrays in human subjects. One patent application was filed and three inventions were disclosed. Two patents have been issued. Technologies that have been successfully commercialized include manufacturing and implantation of the microelectrode array, support systems for simultaneous recording and storing of neural signals from 100 microelectrodes, and systems of high-count implantable microribbon cables. Prototype hardware for acute human investigations has been developed. Success has promoted future testing with human subjects and the Center is developing its technologies for future clinical applications.

**Bionic Technologies, Inc. has successfully commercialized the prototypes developed at the Center to the international scientific community. Since its inception the company has already received three Phase I and two Phase II SBIR awards, a total of \$1.7million in federal support.**

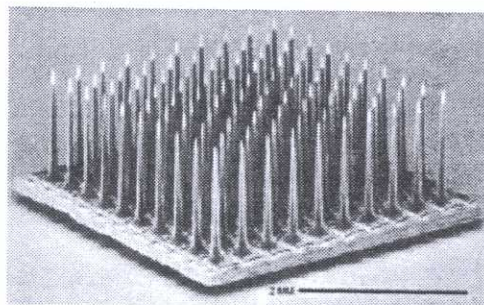
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## Can You Imagine...

... a miniature camera whose video output is fed to the visual cortex of a sight impaired person to provide artificial vision with sufficient resolution for key object identification?

THE CENTER WAS ESTABLISHED TO TRANSFORM THE NEUROPROSTHETIC TECHNOLOGIES DEVELOPED BY THE MORAN LABORATORIES FOR APPLIED VISUAL AND NEURAL SCIENCE INTO PROTOTYPE SYSTEMS FOR FUTURE CLINICAL APPLICATIONS.



Microelectrode array, US Patent #5,215,088, used as part of the electrode array system to monitor and stimulate brain cell activity



# CENTER FOR RAPID MICROBE DETECTION

## CENTER

Established in 1998, the main goal of the Center for Rapid Microbe Detection is to develop technologies that lead to the real time detection of pathogenic microorganisms.

## TECHNOLOGY

In order to detect specific pathogens in real time, novel pathogenic capture molecules, platforms, prototypes are being developed. The potential applications of the technology can span a number of industries including pharmaceutical, biotechnology, veterinary and biomedicine, agriculture, food processing, public health, defense, water and sewage treatment. Four technologies, each for a unique use or application, are being developed: ImmunoFlow, ImmunoDNA, GlycoBind and TissueTag. Each technology is volume independent and is expected to perform in both small and large volumes.

## ACCOMPLISHMENTS

Prototypes have been developed for ImmunoFlow for several different microorganisms including spores of *Bacillus globgii*, *E. coli* O157, *Salmonella* and *Lactobacillus*. The detection time for less than 10 cells in tens of liters is 30 minutes. The center now has three patents issued in the following areas: reconditioning antibiotic adulterated milk products (# 08/424,785), real time detection of antigens (#08/081,889); and immunoDNA capture and detection of contaminants onto a solid surface (#06/071,339). Two patent applications are pending in the following areas: immobilized glycolipids as pathogen capture molecules and tissue tag for the detection of infectious agents. The ImmunoFlow detection system has been licensed to Stellar Technologies LLC, Boise, ID.

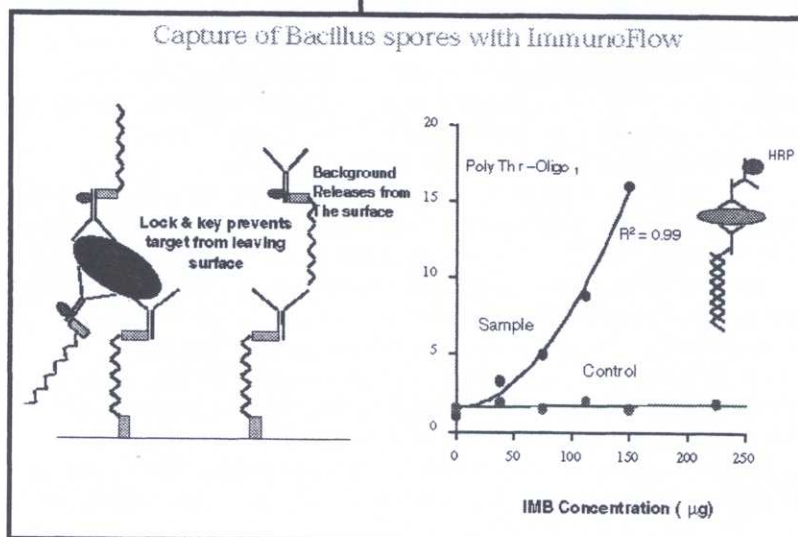
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*Can You Imagine...*

... being able to detect less than 10 cells of a specific pathogen strain in tens of liters of a processed liquid food, for example milk, within 30 minutes?

THE CENTER DEVELOPS TECHNOLOGIES FOR THE REAL TIME DETECTION AND QUANTIFICATION OF MICROORGANISMS, ESPECIALLY HARMFUL PATHOGENS.



Diagrammatic representation of: (1) *Bacillus* spores and *E. coli* O157 (2) Capture DNA with ImmunoFlow (3) Capture of *E. coli* O157, *Listeria*, and *Salmonella* with GlycoBind



# CENTER FOR SCIENTIFIC COMPUTING AND IMAGING

*mo*

## CENTER

The Center for Scientific Computing and Imaging was created in 1996 to make available a commercial version of the SCIRun Software System. This is an interactive, visually based, scientific, engineering, and medical programming environment that allows the interactive construction, manipulation, and visualization of scientific and engineering simulations.

## TECHNOLOGY

SCIRun technology provides scientists and engineers with a new model for scientific computing. The model relies on modern computing technologies such as graphical user interfaces and 3D graphics to provide a visual programming and problem-solving environment to investigate complex problems. The increased flexibility attempts to provide a "computational workbench" for scientific computing where experiments are formed, new methods explored, and tedious coding kept to a minimum.

## ACCOMPLISHMENTS

A start-up company (Visual Influence, Inc.) was created last year to develop products based on the SCIRun software system technology. The company has been granted license rights to specific fields of use including medical imaging applications in exchange for royalty payments and first rights of refusal on future application modules. The company is seeking venture investment capital. In addition, the Center has been approached by several other companies interested in license rights for specific applications and to develop specific technology oriented software packages based on the SCIRun technology. During the current year the SCIRun software has been moved to an open platform in an effort to broaden its usage. It will allow the Center to utilize more outside resources for program debugging and product development. Administrators of the Center are Dr. Christopher Johnson, director, and Dr. Steven Parker, associate director. The Center was also granted ownership of Integrated Paleontological System (IPS) software for further research, development, and commercialization. The Technical Alliance for Computational Stratigraphy (TACS), a consortium of nine petroleum companies, has been established to fund a three-year commercialization and development initiative. The Center for Scientific Computing and Imaging was graduated at the end of the 2000 fiscal year.

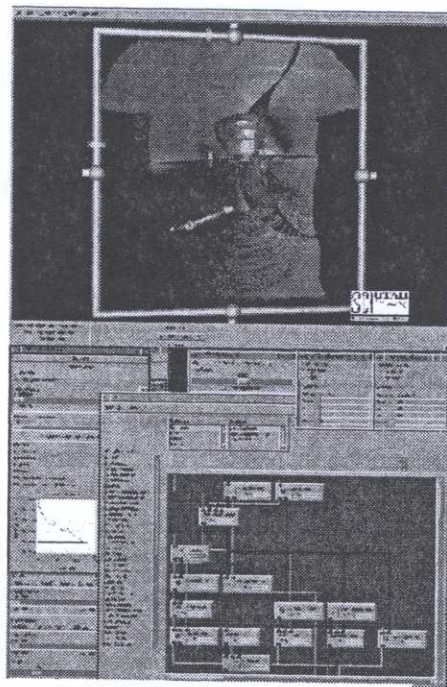
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Web: [www.cs.utah.edu/sci](http://www.cs.utah.edu/sci)

## *Can You Imagine...*

... software that can create detailed, three-dimensional images of human arterial systems from raw MRI data and allow radiologists to rotate the images for complete diagnostic evaluation?

THE CENTER DEVELOPS SOPHISTICATED SOFTWARE THAT ALLOWS THE VISUALIZATION OF COMPLEX ENGINEERING AND SCIENTIFIC SIMULATIONS.



An example SCIRun network, showing the dataflow-programming interface, user interfaces for controlling simulation parameters, and results from a computer simulation of internal cardiac defibrillation.



no

# CENTER FOR SELF-ORGANIZING & INTELLIGENT SYSTEMS

## CENTER

The Center for Self-Organized Intelligent Systems (CSOIS) was first funded in 1993 to build on its core intelligent systems technology to develop commercializable products to the economic advantage of the state. The center provides design services to Utah companies to develop intelligent systems solutions for new and improved commercial products. The center maintains a national and international reputation as a leading contributor to the advancement of intelligent systems research.

## TECHNOLOGY

Intelligent systems technology has grown to include virtually any device and/or software concept which attempts to artificially emulate the unique cognizance and control abilities of the human mind. Artificial neural networks are designed to mimic the ability of the brain and central nervous system to learn and generalize from past experience. Fuzzy logic was introduced as a way of emulating the reasoning processes fundamental to human intelligence. Virtual presence controllers attempt to place the remote human operator or controller in a virtual environment identical to that encountered by the controlled process. Neural control emulates the sensory and communication mechanisms of the human neural system.

## ACCOMPLISHMENTS

The success of the Center in developing a unique intelligent mobility technology has resulted in significant recognition for the Center as a world leader in the design and application of Unmanned Ground Vehicles (UGVs). These remotely controlled vehicles are uniquely suitable for use in agriculture, hazardous environment, and some military applications. Two years ago, the Center was awarded a major Department of Defense UGV contract with enormous economic implications for the state. Consequently CSOIS was granted an unusual sixth year of funding support by the Centers of Excellence program to enable it to take advantage of this outstanding opportunity. During the fiscal year 2000 the Center was awarded a nominal \$50,000 grant to assure continued matching funds for the DOD contract. This has resulted in an additional \$4 Million in defense contracts. In addition the Center received a substantial research contract with one of the nation's largest agricultural equipment manufacturer and is negotiating a three-year multi-million dollar contract with the same company. The company will be marketing automated vehicle technology based licensed centers technology. The spin-off company Visionary Products, Inc. recently moved into a new facility in Logan doubling their available floor space and adding new employees.

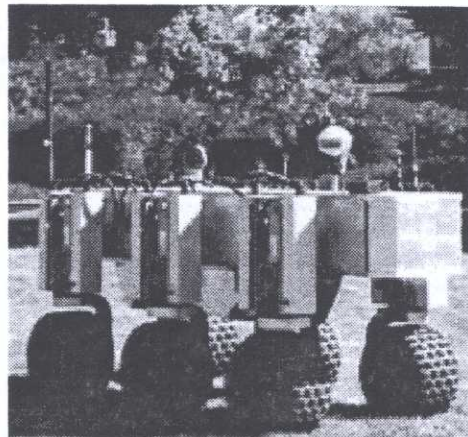
## CONTACT

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*Can You Imagine...*

... driving a remote mechanical rover across a Martian landscape, maneuvering around obstacles, retrieving soil samples, and pointing the rover camera in all directions to view the surrounding landscape, all from your personal computer.

THE CENTER INVESTIGATES  
ELECTRONIC AND SOFTWARE  
SYSTEMS THAT EMULATE THE  
LEARNING AND REASONING  
CAPABILITIES OF THE HUMAN MIND  
AND APPLIES THEM TO COMMERCIAL  
PRODUCTS.



The T2 Omni-Directional Vehicle (ODV), a prototype of an Unmanned Ground Vehicle



# CENTER FOR SOLID OXIDE FUEL CELL TECHNOLOGY

## CENTER

The center was established in 1996, to develop solid oxide fuel cell (SOFC) technology for the direct conversion of chemical energy of a variety of fuels, such as natural gas, coal gas and other reformed logistic fuels, into electricity at a very high efficiency. Initially, the Center is developing cell stack technology for a 2-5 kilowatt unit, which has many potential applications with emphasis on distributed power for residential and remote locations for on-demand electrical power that is clean, efficient, reliable, and noise-free. Small portable power units in the 10-100 Watt ranges are feasible.

## TECHNOLOGY

The center technologies are based on the design and fabrication of novel, anode-supported solid oxide fuel cells with highly efficient electrodes that have a very low resistance. This concept makes it possible to develop a cost-effective, compact power unit for direct conversion of chemical energy of fuels into electricity for remote and residential applications.

## ACCOMPLISHMENTS

The Center has successfully developed a low cost manufacturing method for the fabrication of 10x10 cm cells. Stacks containing up to 40 cells (5x5cm) delivering up to 250 Watts of power for up to 300 hours have been successfully fabricated. In addition, these fuel cells operate at lower temperatures (650 – 800°C), but higher efficiency. The center has been successful in attracting research and development grants from federal agencies as well as the Electric Power Research Institute (EPRI) and the Gas Research Institute (GRI). A consortium formed among University of Utah, EPRI, GRI and Materials and Systems Research Inc., has pooled the intellectual property of the partners to facilitate commercialization. MSRI was successful in receiving an ATP-NIST award for \$3 million, and the Center has received a subcontract from MSRI.

**The Center has successfully leveraged \$495,000 in State funding to procure \$6.3 Million in Federal funding. Three patents have been issued on Center technology and one patent application is pending.**

## CONTACT

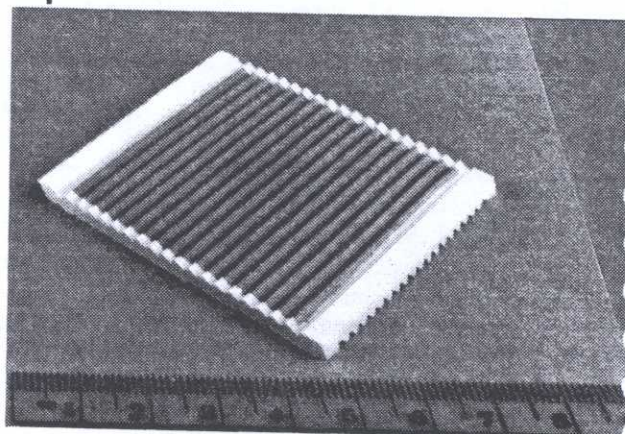
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*Can You Imagine...*

... a portable generator you can take on your next camping trip that efficiently converts propane directly to electricity with no flame, no moving parts, no noise, and only water vapor as an exhaust pollutant?

THE CENTER EXPLORES COMMERCIALY VIABLE METHODS OF CONVERTING GASEOUS FUELS DIRECTLY INTO ELECTRICITY USING HIGH EFFICIENT FUEL CELL TECHNOLOGIES.

Photo of a 5cm x 5cm solid oxide fuel cell (SOFC) made by the center.



The corrugations for the flow of fuel (e.g. natural gas) and oxidant (e.g. air) are in a cross-flow arrangement. The dark top surface is the cathode. SOFCs such as these are currently being configured into a stack. The objective is to construct a 2-5 kW stack for residential applications. The SOFC system will convert chemical energy of a variety of fuels into electricity.

## **V. APPENDICES**

- 1. Financial Summary**
- 2. Summary of Key Commercial Accomplishments**
- 3. Summary of FY 2000-2001 Funded Centers**
- 4. News Articles FY 1998-1999**
- 5. Legislation Creating Centers of Excellence Program**





## CENTERS OF EXCELLENCE - 1999/2000 FINANCIAL SUMMARY

## CENTERS FUNDED IN FISCAL 1999/2000:

	State Funding 1999/2000	Cumulative State Funding	Fed. Match 1999/2000	Indust. Match 1999/2000	Total Match 1999/2000	Cumulative Total Match
Advanced Machining & Joining - BYU	\$110,000	\$110,000	\$25,000	\$373,000	\$398,000	\$398,000
Advanced Structural Composites - BYU	\$110,000	\$220,000	\$0	\$86,340	\$86,340	\$480,313
Asynchronous Circuits - U/U	\$130,000	\$345,000	\$1,108,000	\$0	\$1,108,000	\$4,402,000
Biomedical Optics - U/U	\$120,000	\$120,000	\$306,339	\$222,637	\$528,976	\$528,976
Biomolecular Technologies - U/U	\$130,000	\$244,000	\$508,101	\$0	\$508,101	\$1,003,939
Cell Signalling - U/U	\$175,000	\$260,000	\$0	\$550,362	\$550,362	\$6,189,807
Compliant Mechanisms -BYU	\$110,000	\$110,000	\$275,920	\$97,500	\$373,420	\$373,420
Dairy Technology Commercialization - USU	\$120,000	\$235,000	\$0	\$691,113	\$691,113	\$1,520,576
Electronic Medical Education - U/U	\$120,000	\$120,000	\$240,000	\$0	\$240,000	\$240,000
Harsh Environment Electronics - U/U	\$180,000	\$490,000	\$0	\$390,901	\$390,901	\$1,808,556
Intelligent Computer Tools - BYU	\$125,000	\$295,000	\$0	\$831,135	\$831,135	\$2,539,402
Neural Interfaces - U/U	\$150,000	\$450,000	\$1,473,249	\$30,000	\$1,503,249	\$4,882,665
Rapid Microbe Detection - USU	\$150,000	\$400,000	\$124,314	\$199,360	\$323,674	\$1,108,503
Scientific Computing & Imaging - U/U	\$125,000	\$535,000	\$1,209,287	\$0	\$1,209,287	\$6,284,722
Self-Organizing Intelligent Systems - USU	\$50,000	\$810,000	\$2,046,933	\$1,081,463	\$3,128,396	\$9,037,750
Solid Oxide Fuel Cells -U/U	\$165,000	\$495,000	\$499,000	\$0	\$499,000	\$1,657,397
<b>Subtotals:</b>	<b>\$2,070,000</b>	<b>\$5,239,000</b>	<b>\$7,816,142</b>	<b>\$4,553,811</b>	<b>\$12,369,953</b>	<b>\$42,456,025</b>

## CENTERS FUNDED IN FISCAL 1999/2000:

All Graduated Centers	\$21,174,655
All Distinguished Centers	\$5,890,440

## TOTALS:

\$12,369,953

\$345,112,393

1998/1999 MATCHING RATIO  
CUMULATIVE MATCHING RATIO

6.0 : 1  
10.7 : 1



## CENTERS OF EXCELLENCE - 1999/2000: Summary of Key Commercial Accomplishments

	Spin-Off Companies		Companies Assisted	Patents/Copyrights		Licenses Signed
	New	Total		Pending	Issued	
CENTERS FUNDED IN FISCAL 1999/2000:						
Advanced Machining & Joining - BYU	0	0	13	3	0	1
Advanced Structural Composites - BYU	0	1	30	2	1	1
Asynchronous Circuits - U/U	0	0	7	1	0	1
Biomedical Optics - U/U	0	0	4	2	0	0
Biomolecular Technologies - U/U	1	1	0	1	0	0
Cell Signalling - U/U	0	2	6	25	3	2
Compliant Mechanisms -BYU	0	0	7	6	0	3
Dairy Technology Commercialization - USU	0	1	9	3	1	1
Electronic Medical Education - U/U	0	0	0	2	0	0
Harsh Environment Electronics - U/U	1	2	5	2	2	1
Intelligent Computer Tools - BYU	0	0	9	0	0	2
Neural Interfaces - U/U	0	1	40	4	2	2
Rapid Microbe Detection - USU	0	0	6	2	3	1
Scientific Computing & Imaging - U/U	0	1	0	0	0	4
Self-Organizing Intelligent Systems - USU	0	2	10	8	5	5
Solid Oxide Fuel Cells -U/U	0	0	3	1	3	0
Subtotals:	2	11	149	62	20	24
CENTERS FUNDED IN FISCAL 1999/2000:						
All Graduated Centers		101	669		54	73
All Distinguished Centers		22	191		33	87
TOTALS:	2	134	1009	62	107	184

## Summary of 2001-2001 Funded Centers

*The Centers of Excellence Program was established in 1986 to encourage the commercialization of leading-edge technology developed at Utah's universities and colleges by funding late-stage research and early product development activities. The following Centers have been approved for funding during the 2000-2001 fiscal year. A complete summary of their accomplishments will be published in the Annual Report to the Legislature in November of 2001.*

CENTER	P.I.	INST	CONTACT NUMBERS	BRIEF DESCRIPTION
Acoustic Cooling Technology	Orest Symco, Ph.D	U/U	(801) 581-6132 f. (801) 581-4801 <a href="mailto:orest@physics.utah.edu">orest@physics.utah.edu</a>	Propose to commercialize miniature acoustic cooling devices and technologies for application in electronic circuits, computers, lap-top computers, and other small scale devices.
Advanced Joining of Materials	Tracy Nelson, Ph.D	BYU	(801) 378-6233 f. (801) 378-7575 <a href="mailto:tracy_nelson@byu.com">tracy_nelson@byu.com</a>	Develop new friction stir welding tools and materials and also develop appropriate control systems and multi-axial capability for all levels of manufacturing.
Advanced Structural Composites	David Jensen, Ph.D	BYU	(801) 378-2094 f. (801) 378-4449 <a href="mailto:david@byu.edu">david@byu.edu</a>	Develop the commercial products for the integration of damping materials with composites and the creation of light weight composite materials.
Biomedical Optics	Werner Gellerman, Ph.D	U/U	(801) 581-5222 f. (801) 581-4801 <a href="mailto:werner@mail.physics.utah.edu">werner@mail.physics.utah.edu</a>	Commercialize optical technologies for diagnostic and therapeutic (surgical) treatments in medicine, e.g. non-invasive assessment and therapeutic treatments of mucosal tissues.



Bioremediation	Jack Adams, Ph.D	WSU	(801) 626-6058 f. (801) 626-7467 <a href="mailto:djadams@weber.edu">djadams@weber.edu</a>	Focus is based on patent-pending selenium technology with additional multiple metal removal technologies poised in the commercialization pipeline.
Cell Signaling	Glenn Prestwich, Ph.D	U/U	(801) 581-7063 f. (801) 581-7087 <a href="mailto:gprestwich@deans.pharm.utah.edu">gprestwich@deans.pharm.utah.edu</a>	Focused on technologies important to the treatment of cancer, allergy, asthma, and inflammation. Near-term products for commercialization include chemical agents developed in the center.
Compliant Mechanisms	Larry Howell, Ph.D	BYU	(801) 378-8037 f. (801) 378-5037 <a href="mailto:lhowell@et.byu.edu">lhowell@et.byu.edu</a>	Accelerate and streamline commercial applications of devices that obtain their motion from the deflection of flexible parts rather than from pin joints.
Dairy Technology Commercialization	Carl Brothersen, Ph.D	USU	(435) 797-3466 f. (435) 797-2379 <a href="mailto:wcdprt@cc.usu.edu">wcdprt@cc.usu.edu</a>	Commercialize technologies developed at the Western Dairy Center, USU, including cheese starter cultures, cheese flavor, cheese technology and whey processing.
Electronic Medical Education	Ric Harnsberger M.D. Ann G. Osborn, M.D.	U/U	(801) 581-4624 f. (801) 581-3222 <a href="mailto:Ric.Harnsberger@hsc.utah.edu">Ric.Harnsberger@hsc.utah.edu</a>	Develop marketable medical education products by authoring and packaging tools that will be used to create medical education products, and sell them as a component based medical information management and processing system.

Intelligent Computer Tools	Bill Barrett, Ph.D	BYU	(801) 378-7430 f. (801) 378-7775 <a href="mailto:barrett@cs.byu.edu">barrett@cs.byu.edu</a>	Applies the use of intelligent computer tools for digital image composition, digital library creation, and creation of an interaction with virtual environments.
Multi-Dimensional Information	Stefano Foresti, Ph.D	U/U	(801) 581-3173 f. (801) 585-5366 <a href="mailto:stefano@chpc.utah.edu">stefano@chpc.utah.edu</a> <a href="http://www.infoviz.utah.edu">www.infoviz.utah.edu</a>	Develops a new visualization technology that facilitates the rapid and accurate analysis of large quantities of complex and continuously changing data. The patent pending technology could be utilized in a number of areas including medicine, finance, entertainment, process control, corporate management, quality assurance, network monitoring etc.
Petroleum Research	Milind Deo, Ph.D	U/U	(801) 581-7629 f. (801) 585-9291 <a href="mailto:mddeo@eng.utah.edu">mddeo@eng.utah.edu</a>	Develops cost-effective solutions of liquid hydrocarbon production, handling and transportation. The focus is on assessing the physical properties and chemical thermodynamics of naturally occurring hydrocarbons; optimization of enhanced petroleum recovery; process control and production automation in oil and gas field; and the development of pipeline transportation strategies.



Profitable Uses of Agricultural Byproducts	Conley Hansen, Ph.D	USU	(435) 797-2188 f. (435) 797-2379 <a href="mailto:chansen@cc.usu.edu">chansen@cc.usu.edu</a>	Developing cost-effective technologies to treat and dispose of animal waste generated in agriculture. The conversion of the waste products by anaerobic systems results in "biogas" and nutrients to be used in soil amendments.
Rapid Microbe Detection	Bart Weimer, Ph.D	USU	(435) 797-3356 f. (435) 797-2379 <a href="mailto:milkbugs@cc.usu.edu">milkbugs@cc.usu.edu</a>	Uses immunoflow technology to detect contaminating microbes rapidly and to enhance real time decisions in several industries including food, pharmaceutical and public health.
Smart Sensors	Randy Haupt, Ph.D	USU	(435) 797-2840 f. (435) 797-3054 <a href="mailto:haupt@ieee.org">haupt@ieee.org</a>	Smart sensors probe the environment and modify their function in order to improve their data gathering capability.
Solid Oxide Fuel Cell Technology	Anil Virkar, Ph.D	U/U	(801) 581-5396 f. (801) 581-4816 <a href="mailto:anil.virkar@m.cc.utah.edu">anil.virkar@m.cc.utah.edu</a>	Researches electrochemical devices which can convert chemical-free energy of combustion of a fuel, such as natural gas or hydrogen, directly into electricity at very high efficiencies.

For more information:

Centers of Excellence Program, Office of Technology Development  
Utah Department of Community and Economic Development  
324 South State Street, Suite 500, Salt Lake City, UT 84111  
(801) 538-8770 Fax (801) 538-8773  
E-mail: [hdavis@dcad.state.ut.us](mailto:hdavis@dcad.state.ut.us)  
Web: <http://www.dced.state.ut.us/techdev>

## News Article

**CENTERS OF EXCELLENCE PROGRAM****Center Returns State's Money with New Jobs**

by Lesley Mitchell

The Salt Lake Tribune

Friday, December 03, 1999

Utah's Centers of Excellence Program helped create six new companies and more than two dozen new jobs during the fiscal year ended June 30, according to a report released this week.

The program, part of Utah's Department of Community and Economic Development, provides grants to researchers at the state's colleges and universities to help them start companies.

"The state makes a big investment in higher education and the Centers of Excellence Program helps provide a return on that investment," said Rod Linton, Director of the Utah Office of Technology Development.

Since it was created in 1986, the program has helped start 132 companies. Linton estimated those companies now employ around 1,300 Utahns who earn an average of \$45,000 a year.

Job creation is not the only benefit, he said. The companies also pay royalties to the universities at which they got their start.

Each center conducts research in a different area.

The Center for Advanced Structural Composites at Brigham Young University, for example, is developing ways to improve the strength and stiffness of structures such as bridges and towers. The Center for Dairy Technology Commercialization at Utah State University looks for ways technology can improve the flavor and appearance of dairy products. Each has created a new company.

The state provided nearly \$2 million to such centers during the most recent fiscal year. Most of that money--more than \$1.4 million--funded 11 centers at the University of Utah. Three centers at USU in Logan received \$340,000, while two centers at BYU received \$210,000.

U. of U. professor Peter King said the program is one of few that help commercialize technologies created at universities. He cited the Center for Minerals Technology at the U., which he directs, as an example.

With funding from the Centers of Excellence Program, the Center for Minerals Technology has created two companies over the past two years, both of which create software designed to increase efficiency in the mineral extraction industry.

"Without the Centers of Excellence Program, we would not have been able to help two companies start up," he said.

Companies created through the research centers range from two-employee research firms to Myriad Genetics Inc., a publicly traded genetic testing and gene-discovery company in Salt Lake City that employs several hundred people. Myriad originated at the Center for Cancer Genetics at the U.

The state provides funds to centers for only about five years so it can continually fund new centers. Most centers that no longer receive state funding are able to carry on because they receive funding from other sources, Linton said.

To be eligible for state grants, centers must receive \$2 from other sources for every dollar in funds they receive from the state. In the last fiscal year, the 16 centers received matching funds of nearly \$12 million--well above the requirement.

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### (3) News Articles

## MYRIAD GENETICS

### A Spin-Off Company from the Center for Cancer Genetics Epidemiology

#### **Myriad Genetics Is Hot Stock**

by Guy Boulton

The Salt Lake Tribune

Friday, February 11, 2000

Myriad Genetics Inc. suddenly is the workplace of a lot of happy people and a few newly minted millionaires.

The Salt Lake City company's stock has increased nearly 13-fold since August, soaring from about \$10 a share to close Thursday at \$128.38. And the run shows no signs of slowing. Myriad stock has nearly quadrupled since December. It has nearly doubled so far this month. It was up \$11.50 a share on Thursday.

The roughly 285 people who work for Myriad hold options on more than 722,480 shares at prices from \$10 to \$27 a share. About half those options are held by the company's three founders. But that still leaves a sizable pool for the biotechnology company's employees.

A year ago, when the stock traded around \$8 a share, those stock options were worthless. The stock rose steadily throughout the year. Then Wall Street rediscovered biotechnology. "If it says genomics, it's zoom boom," said John McCamant, contributing editor of Medical Technology Stock Letter.

Since late November and early December, investors have been buying up biotechnology companies, hoping to catch the excitement surrounding the mapping of the human genome, a set of chromosomes that are the basic blueprint of human life.

Other biotech stocks also have soared. But, needless to say, Myriad stockholders are a happy bunch. Anyone smart or lucky enough to have bought 1,000 shares of Myriad in August, when the stock traded around \$10 a share, now has about \$128,000.

To put that in perspective, if someone earned 10 percent a year on an investment, it would take more than 25 years to turn \$10,000 into \$128,000.

It happened in six months for Myriad stockholders. All this has made John Park, an analyst and portfolio manager at the Acorn Funds, look pretty smart. Wanger Asset Management, which manages the family of mutual funds, started buying Myriad in April when the stock was trading around \$8 to \$9 a share. The fund now own about 724,000 shares, or about 7 percent of the company.

At the time, the mutual fund company considered Myriad, which had languished for year, wildly undervalued. The company had a market value of about \$84 million and \$47 million in cash on hand, Park said. It also had research contracts worth more than \$300 million. The past year also brought a steady stream of encouraging announcements from the company.

Myriad discovered genes linked to diabetes and HIV - genes that are potential drug targets. It won additional or new research contracts from Schering, Roche, Monsanto and Novartis. And its losses narrowed.

On Thursday, the company reported a net loss of \$1.9 million, or 19 cents a share, for its second quarter ended Dec. 31, compared with a net loss of \$2.8 million, or 30 cents a share, for the same period the previous year. Revenues rose to \$6.3 million for the quarter compared with \$4.5 million for the same period in its 1999 fiscal year.

The company is still at least one year away from being profitable. But it now has \$60 million in cash. "Things are going in the right direction and will continue," said William Hockett, a company spokesman.

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## **Myriad Genetics Finds \$10 Million In Europe**

by Guy Boulton

The Salt Lake Tribune

Wednesday, October 27, 1999

Myriad Genetics Inc. has raised an additional \$10 million by selling stock to a unit of Schering AG, the giant German drug company, and to funds managed by a Swiss firm. Schering also will expand its collaboration with Myriad to include research on heart disease.

"It reflects confidence in the company's business strategy," said Charles Duncan, an analyst with Tucker Anthony Cleary Gull Inc., an institutional brokerage based in Milwaukee.

Myriad, based in Salt Lake City, already does cancer research for Schering under an agreement struck in October 1998. The biotechnology company, founded in 1991, employs about 270 people at Research Park near the University of Utah.

Schering, based in Berlin and Friedli Corporate Finance, based in Zurich, Switzerland, bought 658,030 shares of Myriad stock at \$15.20 a share, slightly more than the stock's average trading price over the past 20 days, said William Hockett, a Myriad spokesman. Myriad has about 1.1 million shares outstanding.

The company's stock closed Tuesday at \$18.50 a share, up 63 cents a share. The stock's value has more than doubled since July. The stock sale also strengthens Myriad's balance sheet, giving the

company about \$58 million in cash. In addition, it follows a research partnership with Novartis Agricultural Discovery Institute announced last month.

Under that agreement, Novartis will pay Myriad \$33.5 million over the next two years to research the genetic makeup of cereal crops, such as rice, maize, wheat, barley and oats.

Myriad plans to use the \$10 million proceeds from the stock sale to fund its own drug research. That research centers on testing compounds that could be potential drugs and then selling them to pharmaceutical companies.

Under its research agreement with Schering, Myriad is searching for genes that have a role in various cancers and now in heart disease. The company has similar contracts with other pharmaceutical companies.

Separately, the company announced last week that Bayer Corp. took an option for two additional proteins produced by genes linked to dementia. Those proteins are potential targets for new drugs.

Myriad receives a small fee for the options, but will get a significant payment and royalty if Bayer licenses the genes, Hockett said.



## **\$13 Million Deal Links Myriad With Roche**

by Jenifer K. Nii

Deseret News

January 10, 2000

Myriad Genetics Inc. of Salt Lake City is partnering with a Swiss-based biomedical company in a deal worth up to \$13 million.

Myriad will work with Roche, a health-care group specializing in the discovery, development and marketing of pharmaceuticals and diagnostic systems. Roche will utilize Myriad's patented ProNet technology to develop possible drug targets for treating heart disease.

ProNet helps researchers define disease pathways by identifying protein interactions. Those interactions form process pathways - cell growth pathways, cell aging pathways and so on. By understanding those networks, Myriad believes they can be evaluated and modified to disrupt the disease process.

Roche will use Myriad's personnel, equipment, and ProNet technology in Salt Lake City. In exchange, the company has agreed to pay Myriad for research and development, licensing fees, and milestone payments in addition to royalties on the sale of all cardiovascular disease drugs developed under the collaboration.

Though Roche estimated the deal at \$13 million, Myriad spokesman William Hockett said the potential could be much greater. "If we deliver more than the minimal number of drug targets specified in the collaborative agreement, the deal could be worth

substantially more. And we almost always deliver more drug targets than our collaborators anticipate."

This is the fourth ProNet collaboration Myriad has put together in the last year, Hockett said.

"We're really excited. Roche is a great company, and this collaboration brings the total potential value of our ProNet deals to over \$143 million.

This technology is beginning to be recognized for its power in delivering drug targets."

Collaborations are not only a way for Myriad to profit-from royalties and milestone payments, for example. But Hockett said working with other companies also helps Myriad engage in its own research and development.

"The drug targets we discover outside the field of collaboration (with companies like Roche) belong to Myriad," he said. "To date, when working within these collaborative agreements, we have almost always found interesting drug targets that do not belong to the designated field of collaboration. Those go directly to Myriad Pharmaceuticals, our own internal drug development program."

Myriad also has alliances with pharmaceuticals giants Bayer, Eli Lilly, Monsanto, Schering AG, Schering-Plough and Novartis.

## News Article

### SONIC INNOVATIONS

#### A Spin-Off Company from the Center for Signal Processing

##### **Sonic's IPO Success Bucks Recent Trend**

by Matt Krantz - USA TODAY

The Salt Lake Tribune

Thursday, May 04, 2000

Dot-com initial public offerings (IPOs) are becoming dot bombs.

Consider Tuesday. Three initial public offerings began trading: an Internet firm, a biotech company and a hearing-aid maker.

The winner? The hearing-aid maker. Salt Lake City-based Sonic Innovations jumped 51 percent, vs. a 4 percent rise in biotech firm ViroLogic and flat debut of Wherever.net.

Tuesday's great divide between Internet and non-Internet was no fluke. So far this year, a greater percentage of Internet-related IPOs are below their IPO prices than non-Internet related IPOs, said Richard Peterson of Thomson Financial Securities Data. "High expectations for Internet IPOs have evaporated," he said.

To be fair, Sonic Innovations had its attractions. The maker of digital hearing aids that use technology developed at Brigham Young University isn't profitable, but its revenue grew 13 times to \$28.7 million in 1999, said WorldFinance-Net.com.

Also helping: the IPO's relatively small size at just 3.6 million shares, said Vincent Slavin, analyst at Cantor Fitzgerald.

Sonic didn't even have to cut its price to get the deal done, as have many IPOs this year. Its IPO price was \$14 a share -- the top of its \$12 to \$14 range. Its shares closed at \$21.13.

Compare Sonic's debut with that of ViroLogic, which has technology to test genetic mutations. Its shares rose just 31 cents, even though the IPO was priced at \$7, the lower end of its already lowered \$7 to \$8 range. ViroLogic cut its expected pricing range Monday from \$14 to \$16, said AlertIPO.

And despite the popularity of foreign Internet IPOs earlier in the year, Wherever.net fell flat. The Hong Kong-based firm that offers Internet services in China and Taiwan saw its shares budge 3 cents to \$9.03.

Investors should expect ViroLogic and Wherever.net's poor showing on Wall Street to further dry the pipeline for IPOs, especially Internet and biotech names, said Mark Basham, analyst at Standard & Poor's. There now are 100 IPOs in the pipeline, down from more than 250 on March 1, he said.

And many, such as ViroLogic, have had to cut their IPO price. In April, 13 IPOs set their price below the bottom of their filing range, the third-worst period for offering downsizing since August 1998, Peterson said.

Investors should expect fewer big first-day pops, said Jay Ritter, finance professor at the University of Florida. "We'll be going back to more normal times."

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**Expert Says Improved Flavor Could Create Local Goat Cheese Market**

by JoLynne J. Lyon

The Herald Journal/Economy

03/19/2000

Someday, Tooele-produced goat cheese may be on supermarket shelves. And a local cheese expert says that's not only good news for goats; it's great for people who can't stomach stinky cheese.

Robert Fife, project coordinator at the Center for Dairy Technology Commercialization at Utah State University, helped develop some cheese recipes that will be used by Shepherd's Dairy, the goat cheese plant slated to open this summer in Tooele.

And while Fife can't say that there are any goat dairies in Cache Valley large enough to attract a milk collection truck from the cheese plant, he does think it's good news for goat enthusiasts. Goat owners already make sacrifices to keep their animals with little or no economic benefit, Fife said. If the cheese plant pans out, he thinks some goat owners will jump at the chance to get into the dairy business.

How many goats would it take? Shepherd's Dairy Vice President Jed Connell said a farm would need to have 200 to 500 animals before it would be feasible to send a truck out from the cheese plant to collect it. Ultimately Connell hopes that the plant will use goat milk from all over the state. For now, the dairy has its own 130-goat herd.

Cache Valley is a good place for goats, Connell said, since good-quality alfalfa hay is grown here. "Probably one of the keys is good feed, and Utah has it."

Where did the goat cheese idea come from? Connell and his boss, Matthew Arbshay, used to be in the real estate development business. Then one day, Connell said, the boss asked him what he knew about goat cheese.

"I said, 'I don't even know how to spell it,'" Connell recalls.

So they went to the Center for Dairy Technology Commercialization, a Center of Excellence that is affiliated with the university and the Western Dairy Center. It wasn't the first time someone approached the experts there about making a non-cow cheese, said Western Dairy Center Director Donald McMahon, but it was close.

There is a cheese-making facility at USU, and most companies that come to the dairy center just want to use the plant, McMahon said. But Shepherd's Dairy hired some of the USU staff to help them develop their recipes, too.

So far, the dairy has settled on making feta and chevre cheese. The hard, crumbly feta "has a kick," Connell said; the chevre is soft, spreadable and milder in taste.

Fife, who worked on the recipe development, thinks the new product is a departure from the strong-flavored, smelly stuff that most people associate with goat cheese. Since most goat cheese is imported, it is often old by the time it reaches the store shelves and may have been stored at too-high temperatures.

The result is a product that tastes like a goat smells, Fife said, and it may not be anything like it was when it was first produced. But Fife thinks that too often, Americans who want to make cheese take that as the standard, and they turn out the same strong-smelling stuff.

But Fife argues that fresh, high-quality goat milk can be made in to a mild, pleasant cheese, and that Shepherd's Dairy will help change the cheese's goatish image.

Will it sell? Time will tell. But Connell believes that if retailers had a local source for goat cheese, they would stock it.



## News Article

# ONE STOP SATELLITE SOLUTIONS

### A Spin-Off Company from the Center For Aerospace Technology

#### Refurbished ICBM Boosts Utah Satellite

by Lee Siegel  
The Salt Lake Tribune  
January 27, 2000

A satellite built by students and faculty at Utah's Weber State University thundered into space Wednesday night during the nation's first launch of a former nuclear-armed missile recycled to carry scientific payloads.

The Utah-built JAWSAT rode atop a 60-foot-tall Minotaur rocket that blasted off at 8:03 p.m. MST from Vandenberg Air Force Base, Calif.

Once in orbit, JAWSAT--the Joint Air Force Academy/Weber State University Satellite--apparently released four other small satellites. Tonight, one of those satellites was scheduled to deploy six other tiny "picosatellites" no bigger than decks of cards.

All told, 11 new satellites were to circle Earth nearly pole-to-pole in a 460-mile-high orbit during the \$26 million mission.

The spacecraft passed out of radio range 14 minutes after launch. Two hours later, the Northern American Air Defense Command was tracking five objects in JAWSAT's intended orbit, suggesting the Utah satellite had successfully deployed the four small satellites.

Officials did not expect to receive definitive confirmation signals from the satellites until sometime today.

"It will take us a couple weeks to make sure everything is working as planned," said Jay Smith, a Weber State University electronics engineering technology professor at the launch control console.

An Internet "Webcast" of the launch was viewed as far away as France.

"I saw smoke and a big flash of white light coming from the rocket, then the camera tracked it into the

atmosphere," said WSU spokesman Mark Peterson, who watched the Webcast in Ogden. "It was a wonderful sight."

In addition to the satellites, JAWSAT carried two experiments, including a WSU-built satellite-pointing system. Smith said that system would be a key test for One Stop Satellite Solutions, an Ogden company seeking to build small satellites for under \$5 million. Smith is the company's technology vice president.

The launch's main purpose was to demonstrate capabilities of the Minotaur, a rocket built from two stages of a recycled, nuclear-tipped Minuteman II intercontinental ballistic missile and two upper stages of a new Pegasus XL rocket.

Wednesday's launch was the first use of a recycled Minuteman to send payloads into orbit, said Lt. Colleen Lehne, an Air Force spokeswoman.

The Minuteman was refurbished at Utah's Hill Air Force Base, said Smith. "It's pretty exciting for me, growing up during the Cold War years, to see these military programs turned into scientific research programs," he added.

Lehne said recycling 350 Minuteman II missiles decommissioned under an arms-control treaty would be 30 percent cheaper than using new rockets to launch small satellites.

Smith said about 100 students helped design and build JAWSAT over six years. The satellite is a 27-by-27-by-30-inch box-shaped aluminum frame that carried these payloads:

-- The 13-pound Arizona State University Satellite (ASUSAT), which was to transmit signals for amateur radio experiments.



-- Stanford University's Orbiting Picosat Automatic Launcher (OPAL) was to eject six "picosatellites" weighing a pound each.

-- The Optical Calibration Sphere Experiment (OCSE), a balloon-like satellite that was to be tracked for experiments by the Starfire Optical Range at Kirtland Air Force Base, N.M.

-- FalconSat, built by Air Force Academy cadets in Colorado Springs, Colo., was designed to study how satellites are affected by electrically charged particles in space.

-- NASA's Plasma Experiment Satellite (PEST) was to remain on JAWSAT, also measuring charged particles.

-- Weber State's \$1 million Attitude Control Platform (ACP), a device that also was to stay on JAWSAT to help controllers point the satellite. ACP was designed

to provide low-cost pointing capability now lacking on small satellites, Smith said.

One Stop Satellite Solutions hopes to use such technology -- which is patented and licensed by WSU -- to build and sell low-cost small satellites.

JAWSAT's initial launch date last August was delayed by rocket-assembly problems. A Dec. 7 launch was scrubbed when a rocket-tracking radio failed. An attempted launch Jan. 14 was called off when a countdown device malfunctioned and spacecraft batteries ran low on power.

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## News Article

### INFOWEST GLOBAL INTERNET SERVICES

#### A Spin-Off Company from the Center for 3-D Computer Graphics

#### **Infowest And Netutah Announce Merger**

Plans are to Build on the Strengths of Both Companies  
to Form Southern Utah's Largest Internet Service Provider

InfoWest Press Release

April 25, 2000

St. George, Utah (April 19, 2000) - Internet service providers InfoWest Global Internet Services and NetUtah (formerly Interspan, Mountain West ISP, and SGInet) today announced they will be merging to form Southern Utah's Largest ISP.

The merged companies will operate under the InfoWest name and be headquartered in St. George, Utah with offices in Cedar City.

The merger will make InfoWest one of the largest independent Internet service providers in the state of Utah with nearly 12,000 subscribers.

Over time InfoWest will combine the modems, phone lines and services of each company together. Once this is complete NetUtah's customers will see increased quality of service and speed as they are moved onto InfoWest's fiber optic based infrastructure. InfoWest is still the only Internet service provider in Southern Utah with a fully digital system using fiber optics.

InfoWest's customers will also see many benefits such as a more advanced electronic billing system and the addition of NetUtah's very talented technical support and networking professionals.

InfoWest customers will soon be able to see expanded coverage for local access to the Internet in St. George,

Cedar City, Beaver, Milford, Brianhead and Minersville. InfoWest will also continue to provide services to Net Utah's Salt Lake City customers as well.

"We hope to make the transition as easy as possible by merging the companies a piece at a time so we don't create any noticeable problems for our customers", said Kelly Nyberg, President of InfoWest, "We will also be combining the strengths of each company to provide better Internet access for southern Utah residents."

Some of the combined services InfoWest and NetUtah customers will enjoy will be: Extended customer service hours, Internet filtering programs, global roaming for frequent travelers, Internet seminars, electronic billing, DSL High speed broadband access, advanced web site design, Internet advertising, E-commerce and much more.

"Our goal has always been to provide the finest Internet service for Southern Utah. This merger will only strengthen our ability to accomplish that goal", said Nyberg, "We will be taking the best of NetUtah and St. George Internet and form a better, stronger InfoWest."

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## News Article

### MOXTEK

#### A Spin-Off Company from the Center for X-Ray Imaging

##### **Moxtek's Technology Shoots For Stars**

Orem Company Lands Two-Year NASA Contract

by Joe Bauman, Deseret News Staff Writer

Wednesday, February 16, 2000

OREM -- The next time a spacecraft lands on Mars and scientists command it to analyze the surface, chances are a Utah company's instrument will do the work.

The company is MOXTEK, a 1986 spin-off inspired by work at the physics and chemistry departments of Brigham Young University.

In January, MOXTEK landed a \$600,000, two-year contract from NASA to develop a prototype instrument that will make sophisticated X-ray analyses. The lightweight device will use little power but will be able to tell the composition of material it samples.

When that happens, it won't be the first time that MOXTEK has worked on the red planet. The 1997 Pathfinder mission to Mars carried a robotic rover vehicle, Sojourner that roamed around the landscape photographing features and making X-ray spectrographic measurements of rocks.

The measurements were made through a "window" of ultra-thin plastic material developed and produced by MOXTEK. But these studies were relatively crude.

The next time the 56-employee company sends something to Mars, it will be far more than the high-tech window.

"One of the things we're really excited about is we're using some of the company's products on the instrument, like the X-ray windows," said Auturo Reyes, MOXTEK's principal investigator for the project. The instrument also will use a CCD camera and a sample support that the company makes.

This is the second phase of development. Earlier, MOXTEK won a contract from the space agency to test the feasibility of the groundbreaking device,

called "an XRD/XRF instrument for microanalysis of rocks and minerals."

Next, companies submitted 23 proposals in diverse fields for second-phase funding under the Small Business Technology Transfer Research program. NASA selected only eight for this second phase.

"All proposals were peer-reviewed for both technical merit and commercial potential," said Michael Braukus of NASA headquarters in Washington, D.C.

The MOXTEK device analyzes samples using two techniques simultaneously, X-ray diffraction and X-ray fluorescence. It reads the properties of a material that will be powdered and bombarded with X-rays from a tiny X-ray tube carried by the instrument.

During the Deseret News' visit to the MOXTEK plant in Orem, officials showed a CCD chip of the type that will make the readings. The chip, available commercially, works like the film in a camera.

The chip has an array of 384 by 576 pixels on a side. "Each pixel acts as an X-ray detector," said Larry V. Knight, BYU physics professor and MOXTEK co-founder.

Through the measurement, scientists back on Earth will be able to identify the chemical "signature" of the material, he added.

Present devices of this type are bulky and expensive, with units ranging from \$75,000 to \$300,000 apiece. To make the dual measurements that MOXTEK plans to carry out, using today's technology, two instruments would be needed.

"NASA is interested in this because this thing can be made very small," Knight said.

That means a portable instrument like this can be carried by geologists in the field or used in pollution-control equipment to check the gasses leaving smokestacks.

"We think this has commercial possibilities, because it'll be much smaller than instruments in use now," Knight said.

A striking example of another MOXTEK space venture was displayed Feb. 9. At that time, the European Space Agency showed off the images obtained in January by its X-Ray Space Observatory. A stunning view shows information never available before about the nearest galaxy to our own Milky Way, the Large Magellanic Cloud.

Officials of the European Space Agency explained that the hottest X-rays detected in the view "have not been

observed before." A MOXTEK "window" carried by the satellite allowed the X-rays to come through.

The observatory cost in the realm of \$1.3 billion, and it would not function without the MOXTEK window.

"It's really neat," said Clark Turner, the company's chief of market development. "You realize you're part of something bigger."

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## Legislation Forming Centers of Excellence Program

### Part 6 Centers of Excellence

#### 9-2-601. Purpose.

#### 9-2-602. Short title - Definitions.

#### 9-2-603. Administration - Grants.

#### 9-2-601. Purpose.

(1) The Legislature recognizes that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes. These generally come from strong research colleges and universities. Technical research in Utah's colleges and universities should be enhanced and expanded, particularly in those areas targeted by the state for economic development. Most states are enhancing their research base by direct funding, usually on a matching basis. The purpose of this part is to catalyze and enhance the growth of these technologies by encouraging interdisciplinary research activities in targeted areas. The Legislature recognizes that one source of funding is in matching state funds with federal funds and industrial support to provide the needed new technologies.

(2) The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis.

(3) The Legislature recommends that such funds be allocated on a competitive basis to the various colleges and universities in the state. The funds made available should be used to support interdisciplinary research in specialized Centers of Excellence in technologies that are considered to have potential for economic development in this state.

History: C. 1953, 63-62-1, enacted by L. 1985, ch. 103, § 1; 1986, ch. 109, § 1; renumbered by L. 1992, ch. 241, § 60.

#### 9-2-602. Short title - Definitions.

(1) This part is known as the "Centers of Excellence Act."

(2) As used in this part, "Centers of Excellence" means university-based, industry-supported, cooperative research and development programs.

History: C. 1953, 63-62-2, enacted by L. 1985, ch. 103, § 2; 1986, ch. 109, § 2; renumbered by L. 1992, ch. 241, § 61.

#### 9-2-603. Administration - Grants.

(1) This part shall be administered by the Division of Business and Economic Development.

(2) The department may award grants to the various colleges and universities in the state for the purposes of this part.

(3) Recommendations for funding shall be made by the division with the advice of the State Advisory Council for Science and Technology, with the approval of the board. Each proposal shall receive the best available outside review.

(4) In considering each proposal, the division shall weigh technical merit, the level of matching funds from private and federal sources, and the potential for job creation and economic development. Proposals or consortia that combine and coordinate related research at two or more colleges and universities shall be encouraged.

(5) The State Advisory Council on Science and Technology shall review the activities and progress of individual centers on a regular basis and assist the division in preparing an annual report on the accomplishments and direction of the Centers of Excellence Program.

History: C. 1953, 63-62-3, enacted by L. 1986, ch. 109, § 3; renumbered by L. 1992, ch. 241, § 62.

Repeals and Reenactments. - Laws 1986, ch. 109, § 3 repealed former § 63-62-3, as enacted by L. 1953, ch. 103, § 3, relating to creation of a committee for technology excellence in engineering research, and enacted the above section.

